Neurosurgery Practice Questions and Answers

Mark Shaya
Remi Nader
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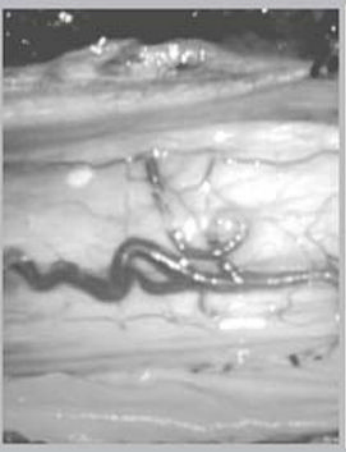

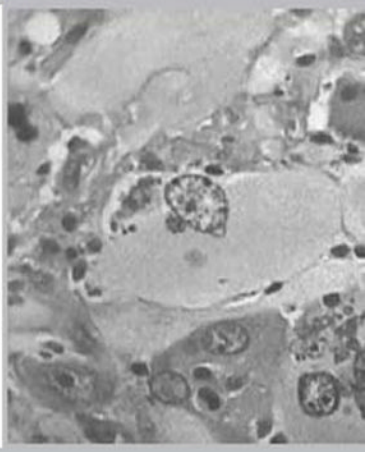

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NEUROSURGERY PRACTICE QUESTIONS AND ANSWERS

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Dedication

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

– *T. S . Eliot*
from *Four Quartets*

For Michelle

Contents

Foreword

Medical knowledge is growing at an exponential rate and information learned just 10 years ago can be obsolete today. Continuing medical education has become a dominant tool to help practitioners keep pace with the development of their respective fields.

To this end, Neurosurgery Practice Questions and Answers by Drs. Mark Shaya, Remi Nader and Anil Nanda will be positively viewed by the neurosurgical community. The authors are to be commended for having produced an intelligent and diverse set of questions that are not meant to tease the readers but rather to force the acquisition of factual knowledge and encourage the application of logic.

The topics are extremely diverse and comprehensive, spanning all the fundamental disciplines that have practical relevance to the practice of neurosurgery, such as neuroanatomy, neuropathology, neuropharmacology, neurophysiology, neurology, and neuroimaging. All in all, over 800 questions are presented with answers, and whenever necessary or useful, they are backed up by specific explanations.

It is indeed rare to find such a well thought out and practical teaching tool. I commend the authors for their effort and perseverance in completing this book.

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Preface

This book started off as my study aid to prepare for the neurosurgery board examination. Frustrated that there were no practice questions for me to use to test myself before the exam, I created questions during my readings. As the time for the exam approached, I had well over two thousand questions written in longhand on legal pads. Afterwards, on the advice of a good friend, I weeded out the bland and mundane questions and compiled the rest into the book you are reading today.

There are no chapters and no divisions by topic. The questions are arranged randomly much like they are on the actual examination. One can take this book as a practice exam, or move more slowly and exhaust each question by cross-reference and repetition. As we all learn at different paces and through different means, I will leave it to the discretion of the reader as to how to use this book most effectively.

I would like to thank Thieme Medical Publishers for its support of this project. I also wish to thank Drs. Arvind Dubey and Paisit Paueksakon, for reading the book for accuracy and for helping me to obtain MRIs and histopathology slides. I would also like to thank Dr. Anil Nanda for his support and suggestions for improvement and for the intraoperative images that were taken from cases of his on which I assisted.

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Questions

1. Regarding the pathophysiology of myasthenia gravis, what is/are the possible mechanisms by which acetylcholine receptor antibodies interfere with neuromuscular transmission?

A. binding to the acetylcholine receptor and blocking the binding of acetylcholine
B. cross-linking acetylcholine receptors, thereby increasing their rate of internalization
C. binding of complement resulting in destruction of the muscle end plate
D. all of the above
E. none of the above

2. All of the following statements are correct regarding the medial lemniscus EXCEPT:

A. Near the sensory decussation, its blood supply comes from the anterior spinal artery.
B. The medial lemniscus can be found in close proximity to the anterolateral tract in the medulla.
C. Its somatotopy in the pons is such that leg fibers are lateral to arm fibers.
D. The fibers of the medial lemniscus arise from the cuneate and gracile nuclei.
E. Brainstem lesions involving medial lemniscus fibers usually include adjacent structures, resulting in motor and sensory losses.

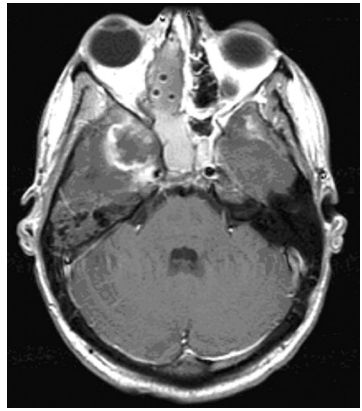
3. The current accepted method for decontamination of surgical instruments that have been used in a confirmed case of Creutzfeldt-Jakob disease (CJD) is
- **A.** 10% formalin
- **B.** 12% glutaraldehyde
- **C.** UV irradiation
- **D.** autoclaving at 121°C
- **E.** sodium hydroxide (2N)

4. Which of the following lines at the craniocervical junction extends from the basion to the opisthion?
- **A.** McRae's line
- **B.** McGregor's line
- **C.** Chamberlain's line
- **D.** Wackenheim's line
- **E.** Anterior marginal line

5. The somatotopic arrangement in the ventral horn is such that
- **A.** the flexors are dorsal to extensors and limbs are medial to trunk.
- **B.** the extensors are dorsal to flexors and limbs are medial to trunk.
- **C.** the flexors are dorsal to extensors and limbs are lateral to trunk.
- **D.** the extensors are dorsal to flexors and limbs are lateral to trunk.
- **E.** none of the above

6. The oxygen extraction ratio is increased when blood flow decreases in all of the following organs EXCEPT:
- **A.** brain
- **B.** kidney
- **C.** liver
- **D.** heart
- **E.** lungs

7. The following MRI image represents an opportunistic infection in a 25-year-old man with acute myelogenous leukemia. All the following statements are true EXCEPT:



A. pathology reveals pleomorphic short and wide septate hyphae
B. treated with Cancidas, Voriconazole, and AmBisome
C. causes hemorrhagic necrosis and ischemic strokes
D. organism originates in the soil
E. may be seen in an immunocompromised patient

8. Somatic motor efferents to the urethral sphincter are located
A. in intermediolateral cell columns of the sacral cord.
B. in Onuf's nucleus.
C. in Barrington's nucleus.
D. all of the above
E. none of the above

9. Cerebral ischemia begins when cerebral perfusion pressure (CPP) falls below
A. 100 mm Hg.
B. 75 mm Hg.
C. 50 mm Hg.
D. 23 mm Hg.
E. 8 mm Hg.

10. Regarding the anatomy near the cavernous sinus, the borders of the clinoidal triangle are cranial nerves
A. I and II.
B. II and III.
C. III and IV.
D. IV and V.
E. none of the above

11. Which of the following is FALSE regarding myasthenia gravis?
- **A.** The first presentation is usually weakness of the extraocular muscles.
- **B.** Weakness that fluctuates and fatigues over the course of the day.
- **C.** Speech may be hypernasal or hoarse in some patients.
- **D.** It may present with a head drop.
- **E.** Dysphagia is worst at breakfast and improves during the course of the day.

12. All of the following are true of polymyositis EXCEPT:
- **A.** It involves a symmetric weakness of proximal limb and trunk muscles.
- **B.** Its onset is insidious.
- **C.** Ocular muscles are usually spared.
- **D.** Muscles are not tender to palpation.
- **E.** Skin changes typically occur before muscle abnormalities.

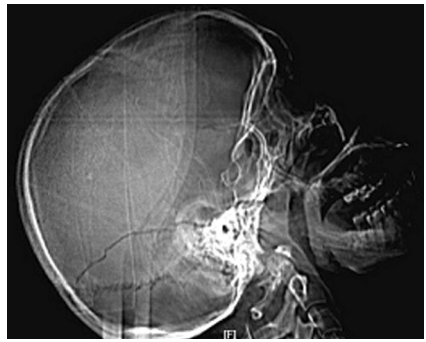
13. *Protein 14–3-3* is elevated in the CSF in which of the following conditions?
- **A.** Creutzfeldt-Jakob disease
- **B.** demyelinating disease
- **C.** head trauma
- **D.** meningoencephalitis
- **E.** all of the above

14. Which of the following statements is most accurate regarding the nerve supplying the teres minor muscle?
- **A.** It has a contribution from the lateral cord.
- **B.** It is an extension of the posterior cord.
- **C.** Ventral rami C8 and T1 are major contributors to this nerve.
- **D.** It is derived from the same cord as the musculocutaneous nerve.
- **E.** None of the above

15. The pterion is formed by the junction of the all of the following EXCEPT:
- **A.** frontal bone
- **B.** sphenoid bone
- **C.** zygomatic bone
- **D.** temporal bone
- **E.** parietal bone

16. Which of the following increase dead space?
- **A.** PE (pulmonary embolus)
- **B.** PEEP (positive end expiratory pressure)
- **C.** emphysema
- **D.** all of the above
- **E.** none of the above

17. Regarding infection in a trauma patient with the following x-ray, the most common pathogen is



A. *S. aureus.*
B. *Pseudomonas.*
C. *Proteus.*
D. *S. pneumoniae.*
E. *E. coli.*

18. Patients with interstitial cystitis
A. are rarely incontinent.
B. have an overwhelming desire to urinate.
C. have activation of a sensory pathway subserving cortical sensation of the bladder without activation of the afferent reflex pathway.
D. all of the above
E. none of the above

19. Which of the following factors increase ICP?
A. movement
B. pain
C. fever
D. Valsalva
E. all of the above

20. The posterior loop of the internal carotid artery and the origin of the meningohypophyseal trunk are exposed in the floor of which triangle?
A. lateral triangle
B. anterior lateral triangle
C. Parkinson's triangle
D. anterior medial triangle
E. none of the above

21. Jitter is best described
- **A.** as synchronous muscle fiber activation between fibers of different motor units.
- **B.** as the difference in timing of muscle fiber activation between two fibers in a single motor unit.
- **C.** as the difference in timing of muscle fiber activation between two fibers of different motor units.
- **D.** as the complete failure of neuromuscular transmission at one muscle fiber in a pair.
- **E.** none of the above

22. Ataxia may be seen in all of the following syndromes EXCEPT:
- **A.** Claude's syndrome
- **B.** Benedikt's syndrome
- **C.** Nothnagel's syndrome
- **D.** Basilar artery syndrome
- **E.** Weber's syndrome

23. Which one of the following findings is seen with subacute combined degeneration?
- **A.** ataxic gait
- **B.** antalgic gait
- **C.** myopathic gait
- **D.** apraxia gait
- **E.** calcaneus gait

24. A lesion of which of the following structures would MOST significantly impair memory?
- **A.** amygdala
- **B.** fornix
- **C.** dorsomedial nucleus of the thalamus
- **D.** mamillary body
- **E.** area 44

25. Which of the following is NOT associated with the findings on this x-ray?

A. weakness of hand
B. Horner's syndrome
C. Raynaud's syndrome
D. traction meningocele
E. ulnar paresthesias

26. Which of the following are true of PEEP (postive end expiratory pressure)?
A. it decreases work of breathing
B. it increases cerebral perfusion pressure
C. it decreases physiologic dead space
D. all of the above
E. none of the above

27. Which of the following can decrease the infection rate of venous catheters?
A. changing the line periodically over a guide-wire
B. occlusive dressings
C. masks and gowns
D. all of the above
E. none of the above

28. Which of the following neurotransmitters promotes penile erection?
A. serotonin
B. dopamine
C. noradrenaline
D. all of the above
E. none of the above

29. The peak reduction in ICP after administration of mannitol occurs
- **A.** in about 4 hours.
- **B.** in about 2 hours.
- **C.** in about 1 hour.
- **D.** in about 30 minutes.
- **E.** in about 15 minutes.

30. The borders of Parkinson's triangle are cranial nerves
- **A.** I and II.
- **B.** II and III.
- **C.** III and IV.
- **D.** IV and V_1
- **E.** none of the above

31. The Tensilon test
- **A.** is not sensitive but very specific for myasthenia gravis (MG).
- **B.** is not particularly useful in ocular MG.
- **C.** when negative, rules out the diagnosis of MG.
- **D.** shows no correlation with subsequent response to pyridostigmine.
- **E.** is not affected by the quantity of acetylcholine receptors.

32. In posterior interosseous syndrome, there is a fingerdrop but no wristdrop because of sparing
- **A.** of the extensor carpi radialis longus.
- **B.** of the extensor carpi radialis brevis.
- **C.** of the extensor digitorum.
- **D.** of the extensor carpi ulnaris.
- **E.** of the brachioradialis.

33. What is the name of the following equation?
$E = (RT/z\mathrm{F}) \ln Q$
- **A.** Nernst equation
- **B.** Goldman equation
- **C.** Poiseuille's equation
- **D.** Henderson-Hasselbalch equation
- **E.** none of the above

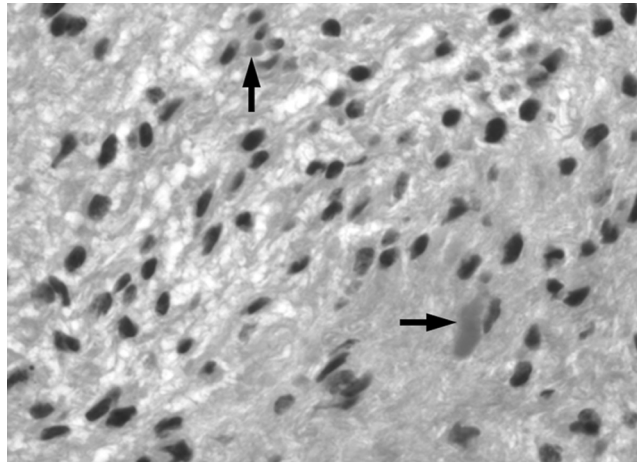
34. Interruption of the inferior geniculocalcarine fibers results
- **A.** in an ipsilateral superior quadrantanopsia.
- **B.** in a contralateral superior quadrantanopsia.
- **C.** in an ipsilateral inferior quadrantanopsia.
- **D.** in a contralateral inferior quadrantanopsia.
- **E.** none of the above

35. Which of the following may be seen with ocular myoclonus?
- **A.** vertical oscillation of the eyes occurring with movements of the palate
- **B.** hypertrophy of the inferior olivary nucleus
- **C.** prior lesions of the central tegmental tract
- **D.** all of the above
- **E.** none of the above

36. All of the following characterize adult respiratory distress syndrome (ARDS) EXCEPT:
- **A.** late hypoxemia
- **B.** diffuse infiltrate
- **C.** leaky capillaries
- **D.** association with sepsis and trauma
- **E.** protein content of fluid greater than with pulmonary edema

37. In a healing wound, maximum collagen deposition occurs
- **A.** at 2 weeks.
- **B.** at 4 weeks.
- **C.** at 6 weeks.
- **D.** at 8 weeks.
- **E.** at 10 weeks.

38. All of the following are true regarding the condition depicted by the following histopathology EXCEPT:



- **A.** It is histologically characterized by a biphasic pattern.
- **B.** Rosenthal fibers are a prerequisite for this diagnosis.
- **C.** It may mimic oligodendroglioma.
- **D.** It is a CNS neoplasm seen with neurofibromatosis type 1.
- **E.** Recurrence is usually a reformation of the cyst rather than the solid tumor.

39. Barbiturates presumably act by which of the following mechanisms?
- **A.** inverse steal phenomenon
- **B.** decreased CMR (cerebral metabolic rate)
- **C.** decreased oxygen consumption
- **D.** scavenger free radicals
- **E.** all of the above

40. The anterolateral middle fossa triangle is defined by cranial nerves
- **A.** II and III.
- **B.** III and IV.
- **C.** IV and V_1.
- **D.** V_1 and V_2.
- **E.** V_2 and V_3.

41. Which of the following is true of myasthenia gravis?
- **A.** The majority of acetylcholine receptor antibodies are of the M subtype.
- **B.** Cyclosporine is used as a first-line treatment.
- **C.** Corticosteroids may reduce the risk of secondary generalization in the ocular form.
- **D.** Pathologic abnormalities of the thymus are found in less than 5% of patients.
- **E.** Weakness confined to the ocular muscles beyond 3 years is associated with poor prognosis.

42. The border of the foramen lacerum is formed
- **A.** by the sphenoid bone.
- **B.** by the temporal bone.
- **C.** by the sphenoid and temporal bones.
- **D.** by the sphenoid, temporal, and occipital bones.
- **E.** by the occipital bone.

43. Absence of inflammation is typical of the following diseases EXCEPT:
- **A.** neuropathy from diphtheria
- **B.** Creutzfeldt-Jakob disease
- **C.** paraneoplastic necrotizing myelopathy
- **D.** central pontine myelinolysis
- **E.** Tolosa-Hunt syndrome

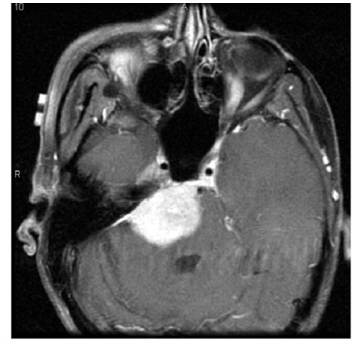
44. Wernicke's area is BEST described as including
- **A.** area 39.
- **B.** the supramarginal, area 40, and posterior one third of the superior temporal gyri.
- **C.** the angular and posterior one third of the superior temporal gyri.
- **D.** areas 39 and 40.
- **E.** the supramarginal and posterior one third of the superior temporal gyri.

45. Anti-pause cell antibody may be seen with childhood infections or paraneoplastic syndrome in adults. Immune-mediated defects in pause cell function most likely result
- **A.** in opsoclonus.
- **B.** in square wave jerks.
- **C.** in downbeat nystagmus.
- **D.** in upbeat nystagmus.
- **E.** none of the above

46. The origin of axons that mediate the swallowing reflex
- **A.** is the solitary nucleus.
- **B.** is the dorsal motor nucleus of X.
- **C.** is the nucleus ambiguus.
- **D.** all of the above
- **E.** none of the above

For the MRI findings in questions **47** to **51**, please choose the answer option that is correct.

1



2

- **A.** scan 1
- **B.** scan 2
- **C.** both scans 1 and 2
- **D.** neither scan 1 nor scan 2

47. Hypertension

48. Early facial nerve involvement

49. Hypotension and bronchoconstriction during resection

50. Diarrhea

51. Early hearing loss and tinnitus

52. Laboratory manifestations of DIC (disseminated intravascular coagulation) include all of the following EXCEPT:
- **A.** increased fibrinogen level
- **B.** prolonged PT
- **C.** prolonged PTT
- **D.** thrombocytopenia
- **E.** fragmented RBCs

53. The mastoid air cells are innervated
- **A.** by V_1.
- **B.** by V_2.
- **C.** by V_3.
- **D.** by IX.
- **E.** by X.

54. Which of the following statements is most accurate regarding the band of Gennari?
- **A.** It divides the third layer of the cortex of areas 17 and 18.
- **B.** It divides the third layer of the cortex of area 17.
- **C.** It divides the fourth layer of the cortex of areas 17 and 18.
- **D.** It divides the fourth layer of the cortex of area 17.
- **E.** It divides the fourth layer of the cortex of areas 17, 18, and 19.

55. The following are prenuclear structures for vertical gaze EXCEPT:
- **A.** nucleus of Darkshevich
- **B.** posterior commissure
- **C.** interstitial nucleus of Cajal
- **D.** rostral interstitial nucleus of the medial longitudinal fasciculus (MLF)
- **E.** nucleus prepositus hypoglossi

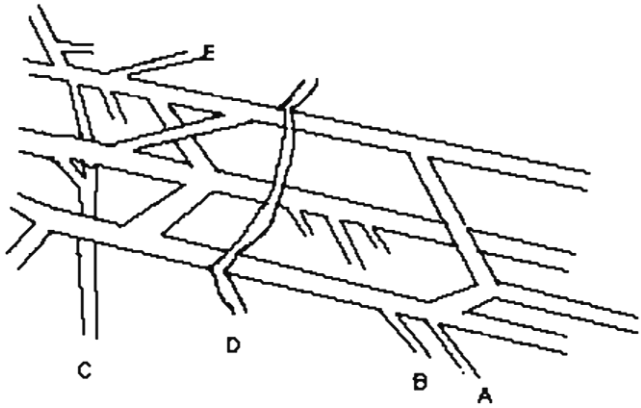
56. Which of the following neurons or nerve cell processes is/are particularly involved with new, novel movements?
- **A.** mossy fibers
- **B.** Betz cell
- **C.** climbing fibers
- **D.** all of the above
- **E.** none of the above

57. Which of the following disease states is characterized by high trophic hormone and low target hormone?
- **A.** Cushing's disease
- **B.** Graves' disease
- **C.** Adrenal tumors
- **D.** Addison's disease
- **E.** None of the above

58. Which of the following intrinsic muscles of the thumb does NOT insert on the proximal phalanx?
- **A.** adductor pollicis
- **B.** abductor pollicis brevis
- **C.** flexor pollicis brevis
- **D.** opponens pollicis
- **E.** extensor pollicis brevis

59. Resolution of brain edema occurs primarily
- **A.** through bulk flow.
- **B.** through vascular clearance.
- **C.** through unknown mechanisms at the blood–brain barrier.
- **D.** all of the above
- **E.** none of the above

For the brachial plexus structures in questions **60** to **64**, choose the appropriate letter in the diagram below:



60. Medial brachial cutaneous nerve

61. Long thoracic nerve

62. Medial antebrachial cutaneous nerve

63. Suprascapular nerve

64. Median pectoral nerve

65. The MLF is responsible for the binocular coordination of the following eye movements EXCEPT:
- **A.** lateral
- **B.** vertical
- **C.** vergence
- **D.** oblique
- **E.** horizontal

66. Which of the following is a distinguishing factor between Apert's and Crouzon's syndrome?
- **A.** pattern of inheritance
- **B.** association with bilateral coronal synostosis
- **C.** severity of mental retardation
- **D.** all of the above
- **E.** none of the above

67. Thyrotropin-releasing hormone (TRH) is a secretagogue
- **A.** for prolactin.
- **B.** for adrenocorticotropic hormone (ACTH).
- **C.** for growth hormone (GH).
- **D.** for thyroid-stimulating hormone (TSH).
- **E.** all of the above

68. Which of the following pairs of nerves is responsible for movement of the ring finger?
- **A.** radial only
- **B.** radial and median
- **C.** radial, median, and ulnar
- **D.** radial, median, and axillary
- **E.** musculocutaneous, median, and ulnar

69. Which of the following types of edema is a feature of hydrocephalus?
- **A.** Vasogenic edema
- **B.** Cytotoxic edema
- **C.** Interstitial edema
- **D.** All of the above
- **E.** None of the above

70. This triangle is bordered by the greater superficial petrosal nerve and drilling here will expose the petrous segment of the internal carotid artery:
- **A.** lateral triangle
- **B.** paramedial triangle
- **C.** Glasscock's triangle
- **D.** Kawase's triangle
- **E.** Parkinson's triangle

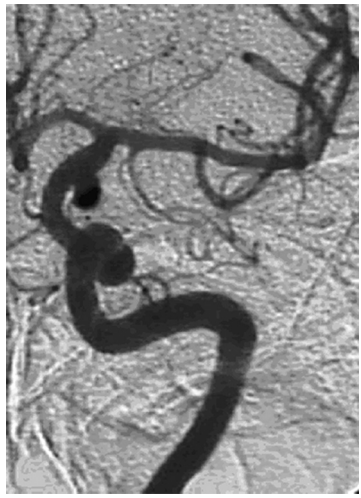
71. Which is FALSE regarding the hormone prolactin (PRL)?
- **A.** Its releasing hormone is located in the arcuate nucleus.
- **B.** Normal levels are 5 to 25 ng per mL.
- **C.** Levels may be increased after syncope.
- **D.** Levels are increased after tonic clonic seizure activity.
- **E.** Levels are increased after nonepileptic seizures.

72. Which of the following circumventricular organs is a central receptor site for angiotensin II?
- **A.** organum vasculosum of the lamina terminalis
- **B.** median eminence of the tuber cinereum
- **C.** subcommissural organ
- **D.** subfornical organ
- **E.** area postrema

73. All of the following are true of the sinuvertebral nerve EXCEPT:
- **A.** It is a branch from the posterior division of the spinal nerve proximal to the dorsal root ganglion.
- **B.** It may enter the intervertebral foramen.
- **C.** It supplies most of the innervation to the posterior aspect of the disk.
- **D.** It may have a proprioceptive and/or nociceptive function.
- **E.** It has been shown to consist of two roots at cervical levels.

74. All of the following are true of conduction aphasia EXCEPT:
- **A.** It is caused by a lesion of the arcuate fasciculus.
- **B.** There is fluent paraphasic speech with intact repetition.
- **C.** It may be caused by occlusion of an MCA posterior temporal branch.
- **D.** Patients may mimic Wernicke's, but are able to understand.
- **E.** Patients are aware of the problem.

75. Which statement is true about the following aneurysm?



A. It arises from the cavernous internal carotid artery.
B. It measures about 6 to 8 mm.
C. It usually presents with pituitary dysfunction.
D. All of the above are true.
E. None of the above are true.

76. During surgery for craniosynostosis, the MOST common event associated with poor outcome is
A. poor sterile technique and infection.
B. excessive blood loss and hypothermia.
C. inexperienced surgeon and need for reoperation.
D. all of the above are equally associated with poor outcome.
E. none of the above

77. Which of the following disorders is due to a defect in neural cell adhesion molecules (N-CAM) that guide the migration of the gonadotropin-releasing hormone (GnRH) neurons?
A. Laron-type dwarfism
B. Kallmann's syndrome
C. Letterer-Siwe disease
D. Wolfram's syndrome
E. none of the above

78. Cell bodies of nerve fibers in the medial brachial cutaneous nerve are found
- **A.** in the dorsal root ganglia only.
- **B.** in the anterior horn only.
- **C.** in the sympathetic chain ganglia and dorsal root ganglia.
- **D.** in the lateral horn and sympathetic chain ganglia.
- **E.** none of the above

79. The perforant path is the main
- **A.** inhibitory pathway of the hippocampus.
- **B.** excitatory pathway of the hippocampus.
- **C.** inhibitory pathway of the hypothalamus.
- **D.** excitatory pathway of the hypothalamus.
- **E.** none of the above

80. Which triangle contains the foramen spinosum?
- **A.** Parkinson's triangle
- **B.** Kawase's triangle
- **C.** Glasscock's triangle
- **D.** Inferior medial triangle
- **E.** Paramedial triangle

81. The most common type of headache is
- **A.** cluster.
- **B.** tension.
- **C.** migraine.
- **D.** postconcussive.
- **E.** due to temporal arteritis.

82. The trochlear nerve can be found in which cistern?
- **A.** cerebellomedullary
- **B.** interpeduncular
- **C.** ambient
- **D.** chiasmatic
- **E.** pontine

83. Which scalene muscle(s) insert on the first rib?
- **A.** anterior scalene
- **B.** anterior and medial
- **C.** medial and posterior
- **D.** anterior and posterior
- **E.** anterior, medial, and posterior

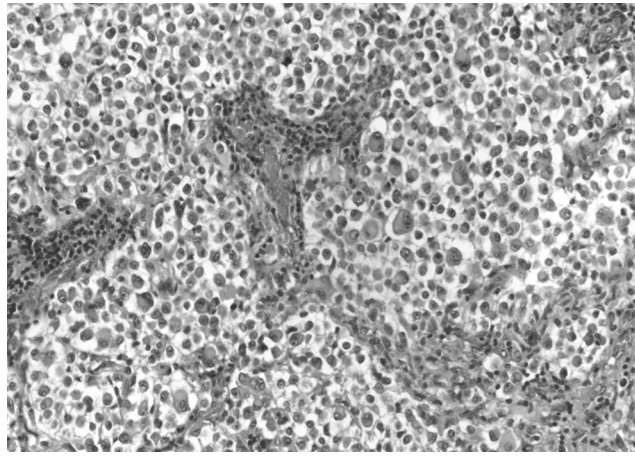
84. A lesion of the left geniculocalcarine tract and the corpus callosum is most likely to cause
- **A.** pure word blindness.
- **B.** pure word deafness.
- **C.** mutism.
- **D.** anomic aphasia.
- **E.** global aphasia.

85. All of the following are true regarding hemispherectomy EXCEPT:
- **A.** Improvement in IQ is often seen postoperatively.
- **B.** Behavior is improved after surgery.
- **C.** It is not necessary to preserve the septum pellucidum.
- **D.** Plugging the foramen of Monro with a piece of temporalis muscle is often performed.
- **E.** Patients are usually mute for about a week after surgery.

86. The principle behind multiple subpial transection for epilepsy is that
- **A.** horizontal fibers have a limited functional role.
- **B.** vertical fibers have a limited functional role.
- **C.** the pia has a limited functional role.
- **D.** all of the above
- **E.** none of the above

87. The presenting symptom of a hypothalamic hamartoma is most commonly
- **A.** headache.
- **B.** vomiting.
- **C.** visual field disturbance.
- **D.** sexual precocity.
- **E.** seizures.

88. All of the following are true of the tumor in this pathology slide EXCEPT:



A. It is found in superficial brain regions.
B. It shows intracellular accumulation of lipids.
C. It corresponds to World Health Organization (WHO) grade II.
D. It carries a dismal prognosis.
E. It presents in patients with a long history of seizures.

89. Schaffer collaterals carry
A. excitatory input from CA1.
B. excitatory input from CA3.
C. inhibitory input from CA1.
D. inhibitory input from CA3.
E. none of the above

90. The size of the medial group of lenticulostriate arteries from M1 is _____ related to the size of the ipsilateral recurrent artery of Heubner.
A. directly
B. inversely
C. not at all
D. exponentially
E. logarithmically

91. Which amino acids are precursors for catecholamines?
A. phenylalanine and tyrosine
B. phenylalanine and tryptophan
C. tyrosine and tryptophan
D. arginine and tyrosine
E. phenylalanine and arginine

92. All of the following structures are supplied by the anterior spinal artery EXCEPT:
- **A.** pyramids
- **B.** medial lemniscus
- **C.** fibers of cranial nerve XII
- **D.** gracile and cuneate nuclei
- **E.** anterior two thirds of the spinal cord

93. During a clinic appointment, patients are asked to sit with their arms dependent, hold their breath, and tilt their head back and turn it to the side. Meanwhile the doctor is checking for the presence or absence of a radial pulse. What is being described?
- **A.** Allen's test
- **B.** Ayer's test
- **C.** Adson's test
- **D.** Addis test
- **E.** Dix-Hallpike maneuver

94. The corticobulbar tract is located in which area of the internal capsule?
- **A.** anterior limb
- **B.** posterior limb
- **C.** retrolenticular limb
- **D.** sublenticular limb
- **E.** genu

95. The medial forebrain bundle interconnects the following areas EXCEPT:
- **A.** septal nuclei
- **B.** raphe nuclei
- **C.** locus ceruleus
- **D.** medulla
- **E.** hypothalamus

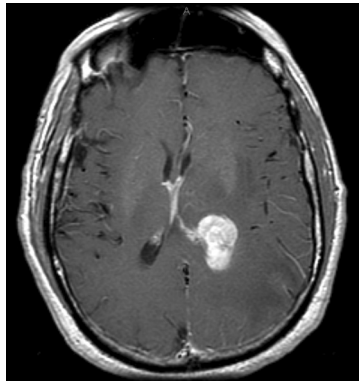
96. Cerebellar tonsillar displacement is seen
- **A.** in Chiari I.
- **B.** in Chiari II.
- **C.** in Crouzon's syndrome.
- **D.** all of the above
- **E.** none of the above

97. The most severe forms of hypothalamic cachexia are seen in lesions
- **A.** of the lateral hypothalamus.
- **B.** of the anterior hypothalamus.
- **C.** of the posterior hypothalamus.
- **D.** of the ventromedial hypothalamus.
- **E.** of the suprachiasmatic hypothalamus.

98. The region of the cortex most closely associated with the conscious perception of smell is
- **A.** the temporal.
- **B.** the cingulate.
- **C.** the prefrontal.
- **D.** the posterior parietal.
- **E.** the anterior parietal.

99. The most prominent inhibitor to apoptosis is
- **A.** Bax.
- **B.** Bcl-2.
- **C.** PAX.
- **D.** HSP-90.
- **E.** none of the above

100. Which of the following pathologic diagnosis is most likely associated with this hemorrhagic lesion?



- **A.** melanoma
- **B.** choriocarcinoma
- **C.** breast carcinoma
- **D.** renal cell carcinoma
- **E.** choroid plexus papilloma

101. The highest incidence of phenylketonuria (PKU) is in which country?
- **A.** Ireland
- **B.** Japan
- **C.** Australia
- **D.** Sweden
- **E.** Mexico

102. The straight sinus is formed from the union
- **A.** of the internal cerebral vein and basal vein.
- **B.** of the inferior sagittal sinus and vein of Galen.
- **C.** of the basal vein and great cerebral vein.
- **D.** of the inferior sagittal vein and basal vein.
- **E.** of the precentral cerebellar vein and internal cerebral vein.

103. A lesion of the vestibular labyrinth that causes images in the visual fields to move back and forth is best described
- **A.** as ocular flutter.
- **B.** as ocular dysmetria.
- **C.** as ocular bobbing.
- **D.** as oscillopsia.
- **E.** as opsoclonus.

104. Atropine mainly affects which type of synapses?
- **A.** parasympathetic preganglionic
- **B.** parasympathetic postganglionic
- **C.** sympathetic postganglionic
- **D.** all of the above
- **E.** none of the above

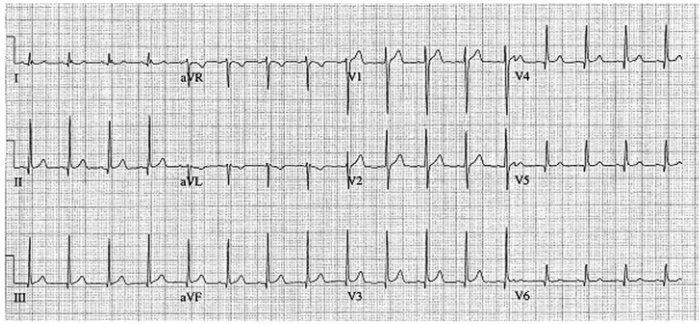
105. Wernicke's encephalopathy is due to deficiency
- **A.** of vitamin B_1.
- **B.** of vitamin B_2.
- **C.** of vitamin B_6.
- **D.** of vitamin B_{12}.
- **E.** none of the above

106. The solitary pathways are concerned
- **A.** with taste.
- **B.** with thoracic viscera.
- **C.** with sudden changes in blood pressure.
- **D.** all of the above
- **E.** none of the above

107. The greatest difference between diffuse astrocytomas (WHO grade II) and anaplastic astrocytomas (WHO grade III) is
- **A.** the MIB-1 fraction.
- **B.** the presence of mitotic activity.
- **C.** the presence of necrosis.
- **D.** angiogenesis.
- **E.** the presence of gemistocytes.

108. The most common intraconal orbital mass is
- **A.** the neurilemmoma.
- **B.** the fibrous histiocytoma.
- **C.** the hemangiopericytoma.
- **D.** the cavernous hemangioma.
- **E.** none of the above

109. Which abnormality does the following EKG show?



- **A.** Hypokalemia
- **B.** Quinidine toxicity
- **C.** Hypothermia
- **D.** Myocardial infarction
- **E.** None of the above

110. The location of the apex in most arteriovenous malformations is
- **A.** cortical.
- **B.** insular.
- **C.** parietal.
- **D.** occipital.
- **E.** periventricular.

111. In catecholamine biosynthesis, the rate-limiting step during conditions of neuronal activation is
- **A.** dopamine β-hydroxylase.
- **B.** tyrosine hydroxylase.
- **C.** aromatic amino acid decarboxylase.
- **D.** monoamine oxidase.
- **E.** phenylethanolamine *N*-methyltransferase.

112. The venous angle is seen angiographically by the junction of which two veins?
- **A.** septal and caudate
- **B.** septal and terminal
- **C.** terminal and caudate
- **D.** internal cerebral and terminal
- **E.** basal and internal cerebral

113. Ocular bobbing may be seen in which of the following?
- **A.** hydrocephalus
- **B.** pontine infarct
- **C.** hepatic encephalopathy
- **D.** trauma
- **E.** all of the above

114. The most likely diagnosis for the following lesion seen on CT is

- **A.** aneurysmal bone cyst.
- **B.** epidermoid granuloma.
- **C.** osteosarcoma.
- **D.** hemangioma.
- **E.** osteoid osteoma.

115. The striae medullares (rhombencephali) arise
- **A.** from the septal nuclei.
- **B.** from the habenular trigone.
- **C.** from the arcuate nuclei.
- **D.** from the amygdala.
- **E.** none of the above

116. The delivery of nutrients and removal of wastes from the vertebral disc is dependent
- **A.** on arterioles and venules.
- **B.** on capillaries penetrating the disc.
- **C.** on diffusion.
- **D.** all of the above
- **E.** none of the above

117. Which of the following statements is true of the olivocochlear bundle?
- **A.** It is part of the ascending auditory pathway to the dorsal cochlear nucleus.
- **B.** It can be seen readily in brainstem sections of the upper pons.
- **C.** It communicates directly with the medial lemniscus.
- **D.** Stimulation of it inhibits acoustic fiber responses to auditory stimuli.
- **E.** It arises from the inferior olivary nucleus and projects to the cochlea.

118. Which of the following orbital tumors is at highest risk of tumor seeding and recurrence during removal?
- **A.** cavernous hemangioma
- **B.** pleomorphic adenoma of the lacrimal gland
- **C.** neurilemmoma
- **D.** hemangiopericytoma
- **E.** fibrous histiocytoma

119. The pterygoid plates are composed of which bones?
- **A.** sphenoid and temporal
- **B.** sphenoid and vomer
- **C.** palatine and sphenoid
- **D.** palatine
- **E.** none of the above

120. Brodmann area 44 comprises
- **A.** Wernicke's area.
- **B.** the visual cortex.
- **C.** Broca's area
- **D.** the prefrontal area.
- **E.** the frontal eye field.

121. The genetic defect in a particular movement disorder called dopa-responsive dystonia is due to a mutation affecting
- **A.** dopa β-hydroxylase formation.
- **B.** the synthesis of a tyrosine hydroxylase cofactor.
- **C.** the norepinephrine transporter.
- **D.** vesicle formation in the catecholamine neuron.
- **E.** the breakdown of catecholamines.

122. Which of the following arteries supplies the deep cerebellar nuclei?
- **A.** posterior inferior cerebellar artery
- **B.** superior cerebellar artery
- **C.** thalamogeniculate branches
- **D.** posterior choroidal artery
- **E.** none of the above

123. In the comatose patient, extensor movements of the arms and weak flexor movements of the legs are most likely to occur with a lesion
- **A.** above the red nucleus.
- **B.** at the red nucleus.
- **C.** between the red nucleus and above the vestibular nuclei.
- **D.** at the vestibular nuclei.
- **E.** below the vestibular nuclei.

124. "Crocodile tears" or lacrimation from gustatory stimulation is classically described as the result of aberrant regeneration of fibers
- **A.** from cranial nerve III reaching the ciliary ganglion.
- **B.** from cranial nerve V reaching the ciliary ganglion.
- **C.** from cranial nerve VII reaching the ciliary ganglion.
- **D.** from cranial nerve III reaching the sphenopalatine ganglion.
- **E.** from cranial nerve VII reaching the sphenopalatine ganglion.

125. Syringomyelia affecting the lower cervical area may result in attenuation or abolition of which of the following somatosensory evoked potentials?
- **A.** N13
- **B.** N20
- **C.** P40
- **D.** N22
- **E.** None of the above

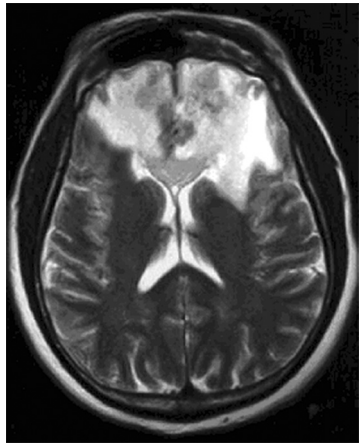
126. If an instrumentation system is too stiff, disuse osteoporosis can occur around the instrumentation. This statement is related
- **A.** to Sherrington's law.
- **B.** to Flouren's law.
- **C.** to Wolff's law.
- **D.** to Delpech's principle.
- **E.** to Jackson's law.

127. In comparison to chordomas, chondrosarcomas
- **A.** arise more laterally.
- **B.** result in more neurologic deficits at presentation.
- **C.** are nearly always S-100 positive.
- **D.** display all of the above features.
- **E.** display none of the above features.

128. Which of the following conditions would benefit most from thalamotomy?
- **A.** medically refractory essential tremor
- **B.** rigidity associated with Parkinson's disease
- **C.** intention tremor from cerebellar stroke
- **D.** bradykinesia associated with progressive supranuclear palsy (PSP)
- **E.** dyskinesia associated with striatonigral degeneration

129. Which of the following is the best measure of the "equator" of the spinal cord when performing a cordotomy for pain management?
- **A.** just ventral to the dentate ligament
- **B.** just dorsal to the dentate ligament
- **C.** at the attachment of the dentate ligament
- **D.** the midway point between the exit of the dorsal and ventral rootlets
- **E.** ~5 mm from the anterior spinal artery

130. When is the earliest time one would expect to observe after radiation therapy the following changes on a T2-weighted MRI taken in a patient who underwent a tumor resection?



- **A.** 1 month
- **B.** 3 months
- **C.** 14 months
- **D.** 48 months
- **E.** 72 months

131. Levels of L-dopa are virtually unmeasurable in the CNS under basal conditions
- **A.** because the activity of tyrosine hydroxylase is low.
- **B.** because L-dopa is localized in vesicles.
- **C.** because the activity of aromatic amino acid decarboxylase is high.
- **D.** because dopamine β-hydroxylase is localized in the vesicles.
- **E.** because the activity of tyrosine hydroxylase is high.

132. The facial nucleus and the spinal trigeminal nucleus and tract are supplied by which artery?
- **A.** PICA
- **B.** AICA
- **C.** SCA
- **D.** Basilar
- **E.** Anterior choroidal

133. Which of the following statements regarding the length constant of a nerve fiber is true?
- **A.** The length constant is directly proportional to the membrane resistance.
- **B.** It is the distance along a fiber where a change in the membrane potential by a given current decays to half its original value.
- **C.** The length constant is directly proportional to the axial resistance.
- **D.** The length constant is greater in unmyelinated than myelinated fibers.
- **E.** none of the above

134. Dysfunction of which cell is the main problem in Raynaud's phenomenon?
- **A.** red blood cell
- **B.** sympathetic neuron
- **C.** platelet
- **D.** mast cell
- **E.** fibroblast

135. Epidural hematomas in children are the result
- **A.** of an arterial injury.
- **B.** of bone oozing.
- **C.** of bleeding from the periosteal surface.
- **D.** all of the above
- **E.** none of the above

136. Spondylolysis most often occurs
- **A.** at L1.
- **B.** at L2.
- **C.** at L3.
- **D.** at L4.
- **E.** at L5.

137. The finding seen in the following photograph is caused by damage

A. to a nerve arising from the upper trunk of the brachial plexus.
B. to a nerve arising from the roots of the brachial plexus.
C. to the dorsal scapular nerve.
D. to the thoracodorsal nerve.
E. none of the above

138. The typical target in thalamotomy for reduction of tremor is
A. Vim
B. Vop
C. Voa
D. VC
E. none of the above

139. Which of the following structures are derived from the telencephalon?
A. caudate
B. putamen
C. amygdala
D. all of the above
E. none of the above

140. The precuneus (Brodmann areas 7 and 31) is located
A. on the medial surface of the frontal lobe.
B. in the secondary visual cortex.
C. within the occipital lobe.
D. on the medial surface of the parietal lobe.
E . on the medial surface of the occipital lobe.

141. Which is FALSE regarding the catecholaminergic neuron?
- **A.** Dopamine β-hydroxylase (DBH) is a copper containing glycoprotein.
- **B.** Phenylethanolamine *N*-methyltransferase (PNMT) methylates norepinephrine (NE) to form epinephrine.
- **C.** Tyrosine hydroxylase is released from cells when its product, norepinephrine, is released.
- **D.** The final enzyme in the dopamine pathway is amino acid decarboxylase (AADC).
- **E.** The final enzyme in the NE pathway is DBH.

142. Neural crest derivatives include all of the following EXCEPT:
- **A.** Schwann cells
- **B.** bipolar cells
- **C.** leptomeninges
- **D.** chromaffin cells of the suprarenal medulla
- **E.** parafollicular cells

143. Which of the following is located in the bony modiolus of the cochlea?
- **A.** scala vestibuli
- **B.** cochlear duct
- **C.** organ of Corti
- **D.** spiral ganglion
- **E.** basilar membrane

144. Damage to this area leaves the patient transiently mute, with complete recovery in a few weeks.
- **A.** Broca's area
- **B.** Wernicke's area
- **C.** Arcuate fasciculus
- **D.** Uncinate fasciculus
- **E.** Supplementary motor area

145. The foramen spinosum is located
- **A.** in the sphenoid bone anterior to the greater and lesser superficial petrosal nerves.
- **B.** in the sphenoid bone between to the greater and lesser superficial petrosal nerves.
- **C.** in the temporal bone posterior to the greater and lesser superficial petrosal nerves.
- **D.** in the temporal bone between the greater and lesser superficial petrosal nerves.
- **E.** in none of the above locations

146. Spondyloptosis corresponds to Meyerding grade
- **A.** I.
- **B.** II.
- **C.** III.
- **D.** IV.
- **E.** V.

147. Golgi tendon organs are
- **A.** sensitive to stretch.
- **B.** in series with extrafusal fibers.
- **C.** encapsulated.
- **D.** all of the above
- **E.** none of the above

148. During a thalamotomy procedure, what are the indications that the electrode is in the correct location?
- **A.** Low-frequency (2 Hz) stimulation causes driving of the tremor.
- **B.** The patient reports contralateral paresthesias.
- **C.** High-frequency (50 Hz) stimulation results in tremor suppression.
- **D.** All of the above
- **E.** None of the above

149. Olfactory glomeruli are made up
- **A.** of granule and tufted cells.
- **B.** of granule and mitral cells.
- **C.** of tufted and mitral cells.
- **D.** of granule cells only.
- **E.** none of the above

150. The sylvian triangle is defined by points along which artery/arteries?
- **A.** MCA only
- **B.** MCA and ACA
- **C.** ACA, MCA, and PCA
- **D.** MCA and PCA
- **E.** ACA, MCA, and PCA

151. Select the FALSE statement regarding monoamine oxidase.
- **A.** MAO_A has high affinity for norepinephrine and serotonin.
- **B.** MAO_A is selectively inhibited by clorgyline.
- **C.** MAO_B has high affinity for *o*-phenylethylamines.
- **D.** MAO_A and MAO_B are associated with the inner mitochondrial membrane.
- **E.** MAO_B is selectively inhibited by deprenyl.

152. The superior part of the fourth ventricle is derived from which of the following vesicles?
- **A.** metencephalon
- **B.** myelencephalon
- **C.** mesencephalon
- **D.** prosencephalon
- **E.** none of the above

153. This structure is a projection of the spiral limbus that overlies the hair cells of the organ of Corti.
- **A.** tectorial membrane
- **B.** basilar membrane
- **C.** vestibular membrane
- **D.** Reissner's membrane
- **E.** None of the above

154. Which fibers are associated with the gag reflex?
- **A.** spinal trigeminal nucleus projections to the nucleus ambiguus
- **B.** solitary projections to the nucleus ambiguus
- **C.** solitary projections to the salivatory nucleus
- **D.** salivatory nucleus projections to the dorsal motor nucleus of the vagus
- **E.** none of the above

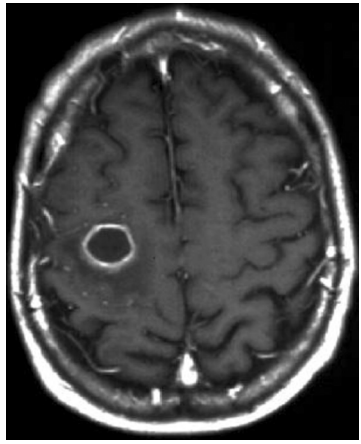
155. A 64-year-old man presents to the clinic with severe back pain going down the left lateral leg (see x-ray). He states that the pain is worse when he reaches and bends to the right. He is most comfortable when he is lying still. He has attempted and failed conservative therapy of medication and physical therapy. If surgery is offered, what would be the procedure of choice from the following options?

A. Lumbar laminectomy of L4-S1
B. Lumbar hemilaminectomy at L4 on left side
C. Pedicle screw fusion of L4-L5
D. Pedicle screw fusion of L3-S1
E. Pedicle screw fusion of L3-L4

156. Which of the following receptors is activated by baclofen and is insensitive to bicuculline?
A. GABA-A
B. GABA-B
C. GABA-C
D. All of the above
E. None of the above

157. All of the following structures pass through the anulus of Zinn (tendinous ring) EXCEPT:
A. cranial nerve III, superior division
B. nasociliary nerve
C. cranial nerve IV
D. cranial nerve III, inferior division
E. cranial nerve VI

For the patient presentations listed in questions **158** to **160**, choose the correct organism associated with the following lesion on MRI:



A. *Proteus*
B. *Streptococcus*
C. *Staphylococcus*
D. *Pseudomonas*

158. A 16-year-old boy who sustained a parietal skull fracture after a motorcycle accident

159. A 60-year-old woman with chronic ear infection

160. A 3-month-old baby with irritability and decreased oral intake

161. Tranylcypromine is
A. an inhibitor of MAO_A.
B. an inhibitor of MAO_B.
C. an inhibitor of catechol methyltransferase (COMT).
D. a reuptake inhibitor of serotonin.
E. an inhibitor of acetylcholinesterase.

162. Which is the embryologic structure that becomes the ventral white commissure in the adult?
A. basal plate
B. floor plate
C. alar plate
D. sulcus limitans
E. None of the above

163. Which of the following is FALSE regarding the syndrome that has a prominent feature illustrated in this CT scan?

A. There is involvement of the upper eyelid.
B. Radiotherapy is not effective.
C. Hemiparesis is contralateral to the facial lesion.
D. The triad classically consists of nevus flammeus, venous malformation, and glaucoma.
E. Abnormalities of chromosome 9 are seen.

164. Cerebrospinal fluid (CSF) is produced
A. by the choroid plexus.
B. by the ependymal surface.
C. by the brain parenchyma.
D. by bulk flow from the brain.
E. all of the above

165. In patients with known systemic cancer, what percentage of single brain lesions are cerebral abscesses or primary brain tumors?
A. less than 0.1%
B. 1%
C. 15%
D. 30%
E. 50%

166. Vigabatrin has anticonvulsant properties related to its interference
A. of GABA breakdown.
B. of GABA synthesis.
C. of GABA reuptake.
D. all of the above
E. none of the above

167. The indusium griseum is a remnant
- **A.** of the habenula.
- **B.** of the hippocampus.
- **C.** of the hypothalamus.
- **D.** of the gyrus of Heschl.
- **E.** none of the above

168. A patient who had a thalamotomy for parkinsonian tremor earlier in the month has noticed weakness of the arm. The most likely explanation for this is that the lesion placed during the thalamotomy was too
- **A.** medial.
- **B.** lateral.
- **C.** anterior.
- **D.** posterior.
- **E.** mild.

169. Which immunosuppressive agent works at the level of the T cell by inhibiting expression of interleukin-2 (IL-2)?
- **A.** azathioprine
- **B.** cyclosporine
- **C.** methotrexate
- **D.** all of the above
- **E.** none of the above

170. Posterior thalamoperforating arteries are the perforators that arise from which artery?
- **A.** Pcom
- **B.** Pcom and P1
- **C.** P1 and P2
- **D.** P2
- **E.** P1.

171. Which nucleus of the hypothalamus gives rise to dopamine innervation of the median eminence?
- **A.** supraoptic
- **B.** dorsomedial
- **C.** lateral
- **D.** arcuate
- **E.** ventromedial

172. The alar plate gives rise to all of the following EXCEPT:
- **A.** gracile and cuneate nuclei
- **B.** inferior olivary nuclei
- **C.** solitary nucleus
- **D.** spinal trigeminal nucleus
- **E.** nucleus ambiguus

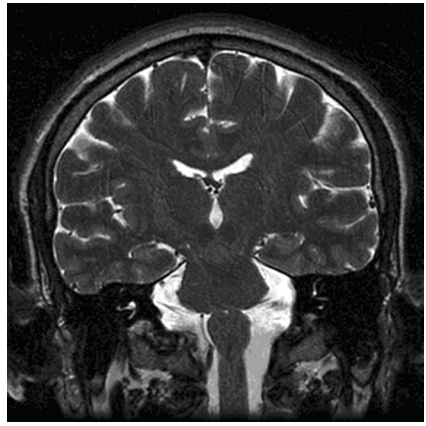
173. Which of the following is FALSE regarding hereditary hemorrhagic telangiectasia (HHT)?

A. It is related to abnormalities in the endoglin gene.
B. Neurologic symptoms are common and may be related to associated pulmonary AVMs.
C. Presentation may be with GI bleeding, hemoptysis, or epistaxis.
D. It is autosomal recessive.
E. Pulmonary and cerebral AVMs are associated with the *9q* gene.

174. In preparation for placement of a ventriculostomy catheter, a resident measures a point 2.5 cm from the midline and 1 cm anterior to the coronal suture. The point that is being measured is

A. Keen's point.
B. Kocher's point.
C. McEwen's point.
D. Barker's point.
E. the sylvian point.

175. A 60-year-old man with the following MRI finding is most likely to present with the following signs on examination:



A. bilateral limb ataxia
B. ipsilateral Horner's syndrome
C. contralateral abducens palsy
D. ipsilateral tongue paralysis
E. none of the above

176. All of the following epilepsy drugs have hepatic enzyme-inducing properties EXCEPT:
- **A.** carbamazepine
- **B.** phenytoin
- **C.** clonazepam
- **D.** primidone
- **E.** phenobarbitone

177. The interposed nuclei project
- **A.** to the contralateral red nucleus.
- **B.** to the ipsilateral red nucleus.
- **C.** to the contralateral thalamus.
- **D.** to the ipsilateral thalamus.
- **E.** none of the above

178. All of the following symptoms may improve after pallidotomy EXCEPT:
- **A.** drug-induced dyskinesias
- **B.** painful dystonias
- **C.** on/off fluctuations
- **D.** bradykinesia
- **E.** postural instability

179. Which of the following is FALSE regarding the femoral triangle?
- **A.** The femoral nerve lies outside the femoral sheath.
- **B.** The femoral nerve is lateral to the femoral artery.
- **C.** It is bounded superiorly by the inguinal ligament.
- **D.** It is covered superficially by the fascia lata.
- **E.** It is bounded laterally by the adductor longus.

180. The anterior inferior cerebellar artery (AICA) originates
- **A.** from the vertebral artery.
- **B.** from the distal one third of the vertebral artery.
- **C.** from the proximal two thirds of the basilar artery.
- **D.** from the posterior cerebral artery.
- **E.** from the distal two thirds of the basilar artery.

181. Which is FALSE regarding serotonin?
- **A.** It is metabolized to melatonin in the pineal gland.
- **B.** The majority of body stores of serotonin are found in the CNS.
- **C.** Two critical enzymes take part in its synthesis.
- **D.** Tryptophan is the precursor amino acid.
- **E.** It has an indole structure.

182. The basal plate gives rise to all of the following EXCEPT:
- **A.** oculomotor nucleus
- **B.** trochlear nucleus
- **C.** substantia nigra
- **D.** red nucleus
- **E.** superior colliculus

183. Livedo reticularis, subendothelial smooth muscle cell proliferation, and presentation with multiple ischemic strokes are features
- **A.** of Sneddon's syndrome.
- **B.** of Seddon's syndrome.
- **C.** of Scheie's syndrome.
- **D.** of Schmidt's syndrome.
- **E.** of Schanz's syndrome.

184. During the abdominal portion of the operation for a ventriculoperitoneal (VP) shunt, if the surgeon is below the arcuate line, which structures would lie behind the rectus abdominus?
- **A.** external oblique aponeurosis
- **B.** internal oblique aponeurosis
- **C.** transversus abdominis aponeurosis
- **D.** transversalis fascia
- **E.** none of the above

185. Which of the following posterior fossa tumors has the tendency to arise from the floor of the fourth ventricle?
- **A.** medulloblastoma
- **B.** ependymoma
- **C.** astrocytoma
- **D.** hemangioblastoma
- **E.** none of the above

186. Which of the following is true of Lissauer's tract?
- **A.** fibers are derived from the lateral division of the dorsal roots
- **B.** contains Aδ fibers
- **C.** contains C fibers
- **D.** all of the above
- **E.** none of the above

187. The limen insula can be found
- **A.** in the occipital lobe.
- **B.** at the junction of the insula and frontal lobe.
- **C.** within the third ventricle.
- **D.** in cross sections through the pons.
- **E.** in none of the above.

188. During pallidotomy, when the surgeon believes the electrode is near the target, a high-frequency stimulation is performed to ensure that the electrode is not too close
- **A.** to the thalamus.
- **B.** to the internal capsule.
- **C.** to the optic tract.
- **D.** to the amygdala.
- **E.** to the putamen.

189. Which of the following structures is NOT within the adductor canal?
- **A.** femoral artery
- **B.** femoral vein
- **C.** great saphenous vein
- **D.** nerve to vastus medialis
- **E.** saphenous nerve

190. An important landmark for identifying the junction of the tegmentum and the cerebral peduncle is
- **A.** the anterior pontomesencephalic vein.
- **B.** the lateral mesencephalic vein.
- **C.** the precentral cerebellar vein.
- **D.** the vein of Galen.
- **E.** the superior vermian vein.

191. This amino acid is not only a precursor to GABA but is also a neurotransmitter.
- **A.** glycine
- **B.** glutamate
- **C.** arginine
- **D.** tyrosine
- **E.** tryptophan

For the actions and metabolisms in questions **192** to **195**, choose the correct medications.
- **A.** hydralazine
- **B.** phentolamine
- **C.** nitroglycerine
- **D.** nitroprusside

192. Metabolized by the kidneys, equal effects on arterial and venous vasodilatation

193. Metabolized by the liver, more potent venous vasodilatation

194. Metabolized by the kidneys, more potent arterial vasodilatation

195. Metabolized by the liver, more potent arterial vasodilatation

196. Which of the following findings is LEAST likely to be associated with the following MRI scan?

A. elevated serum angiotensin converting enzyme
B. eosinophilic granuloma
C. meningitis
D. elevated adrenocorticotrophic hormone
E. sarcoidosis

197. A central facial palsy would only involve
A. the ipsilateral upper face.
B. the ipsilateral lower face.
C. the contralateral upper face.
D. the contralateral lower face.
E. none of the above

198. Palatal nystagmus is most likely due to a lesion
A. of the dorsal spinocerebellar tract.
B. of the corticospinal tract.
C. of the cerebral peduncle.
D. of the central tegmental tract.
E. of the frontal eye field.

199. The single best predictor for patients with esthesioneuroblastoma is
A. completeness of primary tumor excision.
B. TP53 overexpression.
C. the presence of Homer-Wright rosettes on pathology.
D. neuron-specific enolase expression.
E. the destruction of the cribriform plate.

200. During a lateral suboccipital approach for tumor resection, cerebellar retraction may be excessive if the brainstem auditory evoked potential (BSAEP) indicates
- **A.** increased latency in wave 3.
- **B.** decreased latency in wave 4.
- **C.** decreased latency in wave 5.
- **D.** increased latency in wave 4.
- **E.** increased latency in wave 5.

201. The best characterized glutamate-containing neurons are found
- **A.** in the Purkinje cells of the cerebellum.
- **B.** in the pyramidal cells of the cerebral cortex.
- **C.** in the pyramidal cells of the hippocampus.
- **D.** in the septal region.
- **E.** in the lateral entorhinal cortex.

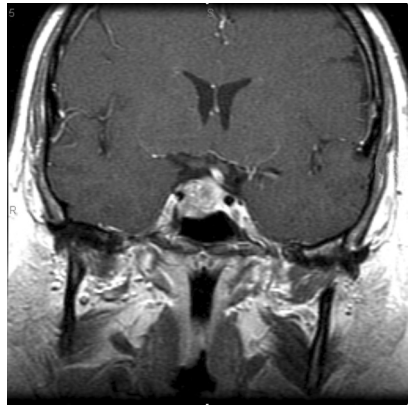
202. All of the following statements are true of nuclear chain fibers EXCEPT:
- **A.** They receive group Ia primary afferent fibers.
- **B.** They receive group II secondary afferent fibers.
- **C.** They are associated with flower spray endings.
- **D.** They are associated with static gamma efferent fibers.
- **E.** They respond to muscle tension.

203. Patients who continue to display mental status changes after correction of diabetic ketoacidosis should be investigated
- **A.** for cysticercosis.
- **B.** for histoplasmosis.
- **C.** for lyme disease.
- **D.** for mucormycosis.
- **E.** for hydatid disease.

204. Which of the following is FALSE with regard to shunt nephritis?
- **A.** It is a well-described complication of VP shunts.
- **B.** It is due to deposition of immune complexes in the glomeruli of kidneys.
- **C.** The diagnosis is suspected with hematuria, elevated erythrocyte sedimentation rate (ESR), and decreased complement levels.
- **D.** Proper treatment entails removing the entire shunt.
- **E.** There is an elevated peripheral WBC count.

205. Regarding dysembryoplastic neuroepithelial tumor (DNET), which of the following is FALSE?
- **A.** Male predominance has been noted.
- **B.** It is a surgically curable cause of partial seizures.
- **C.** There is an abundance of mitoses with no necrosis.
- **D.** It is a mixed glial and neuronal neoplasm.
- **E.** Shows on CT as a hypodense pseudocystic lesion.

206. Which of the following is the most appropriate next step in management in a hypertensive patient who sustained recurrent falling episodes and complains of headache with the following MRI findings:



A. transsphenoidal resection
B. bromocriptine
C. angiography
D. ophthalmologic evaluation
E. transcranial resection

207. The saccule sends fibers to the _____vestibular ganglion that project to the _____vestibular nucleus.
A. superior, superior
B. superior, inferior
C. inferior, superior
D. inferior, inferior
E. none of the above

208. Which of the following tracts traverse the restiform body?
A. olivocerebellar
B. reticulocerebellar
C. dorsal spinocerebellar
D. all of the above
E. none of the above

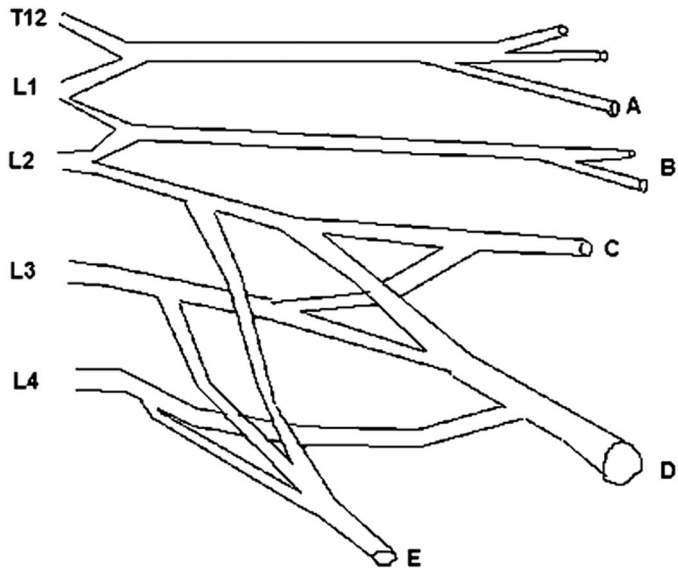
209. A favorable prognosis in neuroblastomas is related
A. to n-Myc amplification.
B. to 1p deletion.
C. to TrkA expression.
D. to older age.
E. none of the above

210. For microvascular decompression in a patient with trigeminal neuralgia, the first burr hole is best placed
- **A.** at the mastoid tip.
- **B.** at the keyhole.
- **C.** at the asterion.
- **D.** at the bregma.
- **E.** at the lambda.

211. The definitive marker for cholinergic neurons is
- **A.** acetyl CoA.
- **B.** acetylcholinesterase.
- **C.** choline acetyltransferase.
- **D.** choline.
- **E.** sensitivity to hemicholinium-3.

212. Tanycytes are most likely to be found
- **A.** in the wall of the third ventricle.
- **B.** in a high-grade glioma.
- **C.** in a low-grade glioma.
- **D.** in the cauda equina.
- **E.** none of the above

For the statements in questions **213** to **216**, choose the appropriate structure on the diagram:



213. Genitofemoral nerve

214. Innervates the sartorius muscle

215. Enables leg abduction

216. Meralgia paraesthetica

217. The vagus nerve leaves the medulla
- **A.** between the pyramid and the olive.
- **B.** between the olive and the inferior cerebellar peduncle.
- **C.** from the same sulcus as CN XII.
- **D.** from the dorsomedial sulcus.
- **E.** from none of the above.

218. Bilateral damage to the medial basal occipitotemporal cortex results
- **A.** in astereognosis.
- **B.** in prosopagnosia.
- **C.** in alexia without agraphia.
- **D.** in auditory agnosia.
- **E.** in autotopagnosia.

219. Neuroblastomas may present
- **A.** with spinal cord compression.
- **B.** with Ondine's curse.
- **C.** with opsoclonus syndrome.
- **D.** with diarrhea.
- **E.** all of the above

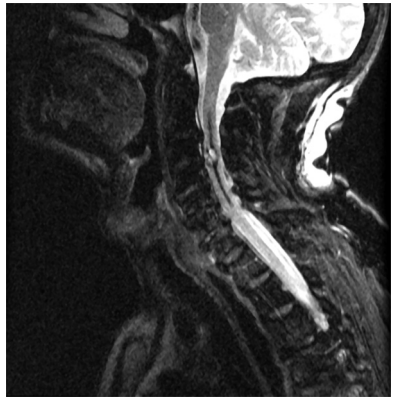
220. One of the most significant prognostic indicators for successful prolactinoma surgery is
- **A.** results of the Goldman perimetry field.
- **B.** being male.
- **C.** the preoperative prolactin level.
- **D.** age of the patient.
- **E.** being female.

221. Nitric oxide synthase is responsible
- **A.** for conversion of R-arginine into NO.
- **B.** for conversion of citrulline into NO.
- **C.** for production of NO and L-arginine.
- **D.** for production of NO and citrulline.
- **E.** none of the above

222. Which Rexed lamina is homologous to the spinal trigeminal tract?
- **A.** I
- **B.** II
- **C.** III and IV
- **D.** VII
- **E.** IX

223. The most common presentation of vein of Galen malformation in the neonate is
- **A.** an intracranial bruit with heart failure.
- **B.** subarachnoid hemorrhage.
- **C.** hydrocephalus.
- **D.** developmental delay.
- **E.** ocular symptoms.

224. Which of the following associations based on this MRI scan is FALSE?



- **A.** subarachnoid hemorrhage
- **B.** progressive ascending paraplegic syndrome
- **C.** the definitive therapy is microsurgical elimination
- **D.** tend to bleed in elderly patients
- **E.** it may represent a vascular anomaly

225. The arcuate eminence is the bony landmark of the
- **A.** superior petrosal sinus.
- **B.** superior semicircular canal.
- **C.** middle meningeal artery.
- **D.** vein of Labbe.
- **E.** none of the above

226. Which of the following is true of the medial posterior choroidal artery?
- **A.** It is a branch of the posterior cerebral artery.
- **B.** It supplies the choroid plexus of the third ventricle.
- **C.** It supplies the choroid plexus of the lateral ventricles.
- **D.** all of the above
- **E.** none of the above

227. The calamus scriptorius can be found
- **A.** in the third ventricle.
- **B.** in the fourth ventricle.
- **C.** in the lateral ventricle.
- **D.** at the cauda equina.
- **E.** none of the above

228. Brain waves that are characteristic for deep sleep and have a frequency of 1 to 3 per second are
- **A.** α waves.
- **B.** β waves.
- **C.** theta waves.
- **D.** delta waves.
- **E.** none of the above

229. Which cranial nerves innervate muscles that attach to the styloid process?
- **A.** VII, IX, X
- **B.** IX, X
- **C.** IX, X, XII
- **D.** VII, X
- **E.** VII, IX, XII

230. All of the following are true regarding hyperbaric oxygen therapy in postoperative neurosurgical infection, EXCEPT:
- **A.** It increases the oxygen tension in the infected tissues.
- **B.** It results in a direct bactericidal effect on anaerobic organisms.
- **C.** It results in improved phagocytosis of *Staphylococcus.*
- **D.** It should be used as an adjunct to surgery and antibiotics.
- **E.** It is a temporizing measure until definitive therapy can be instituted.

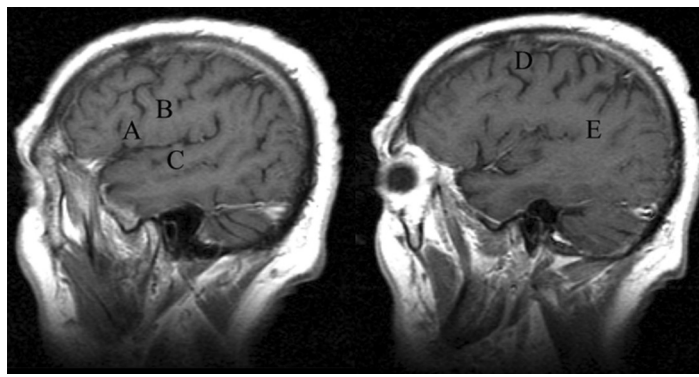
231. Allodynia is a condition
- **A.** where a painful response is produced by an innocuous mechanical stimulus.
- **B.** where a painful response is felt in an amputated limb.
- **C.** where a painful response is felt on the opposite side of the body.
- **D.** where there is sensitization of spinocerebellar neurons.
- **E.** all of the above

232. The nucleus dorsalis of Clarke corresponds to which Rexed lamina?
- **A.** I
- **B.** II
- **C.** III and IV
- **D.** VII
- **E.** IX

233. All of the following are true of encephaloceles EXCEPT:
- **A.** Occipital encephaloceles are the most common type.
- **B.** Frontoethmoidal (sincipital) are the most common type in Southeast Asia and among Australian aborigines.
- **C.** Parietal encephaloceles are associated with Chiari II malformation in up to one third of cases.
- **D.** Basal encephaloceles are associated with defects along the sphenoid bone.
- **E.** Children with basal encephaloceles have a low risk of developing meningitis.

234. On a horizontal section of the brain, the anterior limb of the internal capsule can be found
- **A.** between the thalamus and the globus pallidus.
- **B.** between the caudate and the corpus striatum.
- **C.** between the caudate and the thalamus.
- **D.** between the thalamus and putamen.
- **E.** none of the above

For the structures in questions **235** to **238**, choose their appropriate location on the following MRI:



235. Supplementary motor cortex

236. Operculum

237. Premotor cortex

238. Heschl's gyrus

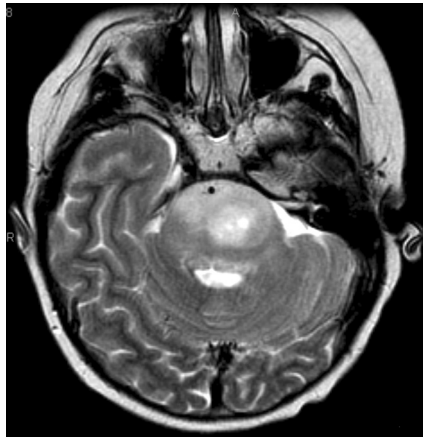
239. Which of the following are true of the greater occipital nerve?
- **A.** It emerges inferior to the inferior obliquus capitis muscle.
- **B.** It is accompanied by the occipital artery.
- **C.** It is a sensory nerve.
- **D.** All of the above
- **E.** None of the above

240. Which of the following statements is FALSE regarding arachidonic acid metabolism?
- **A.** Aspirin inhibits both cyclooxygenase (COX) isoforms.
- **B.** Arachidonic acid is a substrate for production of ceramide.
- **C.** Thromboxane synthesis inhibitors lead to depletion of arachidonic acid.
- **D.** Arachidonic acid is a substrate for COX I.
- **E.** Prostaglandin H_2 (PGH_2) is a product of the COX enzyme.

241. The basal ganglia output for eye movements is
- **A.** the subthalamic nucleus.
- **B.** the substantia nigra pars compacta.
- **C.** the substantia nigra pars reticulata.
- **D.** the globus pallidus interna.
- **E.** the globus pallidus externa.

242. Which area receives dorsal roots?
- **A.** dorsal lateral sulcus
- **B.** dorsal intermediate sulcus
- **C.** ventral lateral sulcus
- **D.** dorsal median sulcus
- **E.** ventral intermediate sulcus

243. Which statement is true in a 4-year-old with the following MRI findings?



A. Biopsy is usually indicated to confirm the diagnosis.
B. Hyperfractionated radiation therapy has not been shown to improve survival.
C. Comprise 30% of pediatric CNS tumors.
D. No proven chemotherapeutic regimen.
E. Most lesions will regress spontaneously.

For the medications in questions **244** to **247**, choose their correct effects on the cardiovascular system:

A. Increases refractory period, decreases contractility, increases preload (or left ventricular end diastolic pressure)
B. Decreases refractory period, decreases contractility, decreases preload
C. Decreases refractory period, decreases contractility, increases preload
D. Decreases refractory period, increases contractility, increases preload

244. Procainamide

245. Propranolol

246. Phenytoin

247. Lidocaine

248. All of the following are true of Lhermitte-Duclos disease EXCEPT:
- **A.** It is also called dysplastic gangliocytoma of the cerebellum.
- **B.** There is demyelination of the granular cell layer of the cerebellum.
- **C.** There is thickening of one or more cerebellar folia.
- **D.** Calcification and hydrocephalus may occur in this disorder.
- **E.** A laminated pattern of folia on T2-weighted MRI is suggestive.

249. Which of the following is consistent with the diagnosis of typical trigeminal neuralgia?
- **A.** unilateral symptoms
- **B.** sensory deficit
- **C.** decreased corneal reflex
- **D.** all of the above
- **E.** none of the above

250. *N*-Butylcyanoacrylate is used
- **A.** for cranioplasty.
- **B.** for endovascular procedures.
- **C.** for topical wound dressings.
- **D.** for vasospasm in the ICU.
- **E.** none of the above

251. A 24-year-old man is brought into the emergency room after having a motorcycle accident. He has a scalp wound that is bleeding profusely. His eyes open only after his name is loudly called; however, he is confused when asked about the details of the accident. He obeys commands in all extremities. In this case, the Glasgow Coma Scale (GCS) score is
- **A.** 15.
- **B.** 14.
- **C.** 13.
- **D.** 12.
- **E.** 11.

252. The ciliospinal center of Budge can be found at which spinal cord level?
- **A.** midcervical
- **B.** upper thoracic
- **C.** lower thoracic
- **D.** lumbar
- **E.** sacral

253. The serum level of phenytoin is increased by all of the following EXCEPT:
- **A.** cimetidine
- **B.** chloramphenicol
- **C.** valproic acid
- **D.** uremia
- **E.** aspirin

254. Which of the following deficits or findings in lateral medullary syndrome is contralateral to the primary pathology?
- **A.** pain and temperature of the body
- **B.** pain and temperature of the face
- **C.** Horner's syndrome
- **D.** falling
- **E.** none of the above

255. Which of the following fractures is most commonly associated with anterior cord syndrome?
- **A.** clay shoveler's fracture
- **B.** wedge fracture
- **C.** teardrop fracture
- **D.** Chance fracture
- **E.** transverse process fracture

256. What are the similarities between thrombotic thrombocytopenia purpura (TTP) and idiopathic thrombocytopenic purpura (ITP)?
- **A.** decreased numbers of platelets
- **B.** immune-mediated
- **C.** treated with platelet replacement
- **D.** all of the above
- **E.** none of the above

257. All of the following structures are derived from ectoderm EXCEPT:
- **A.** pia
- **B.** dura
- **C.** arachnoid
- **D.** glia
- **E.** ependyma

258. The most common primary tumor of the septum pellucidum is
- **A.** meningioma.
- **B.** oligodendroglioma.
- **C.** astrocytoma.
- **D.** ependymoma.
- **E.** none of the above

259. The most common conflicting vessel in trigeminal neuralgia is
- **A.** the AICA.
- **B.** the PICA.
- **C.** the SCA.
- **D.** the satellite veins.
- **E.** none of the above

260. The ELANA technique may be helpful
- **A.** in vertebrobasilar ischemia.
- **B.** in controlling ICP.
- **C.** in vasospasm.
- **D.** in tumor biology.
- **E.** in spinal fusion.

261. This cervical spine MRI demonstrates

- **A.** metastatic disease.
- **B.** a jumped facet.
- **C.** a burst fracture.
- **D.** a teardrop fracture.
- **E.** an epidural abscess.

262. A 64-year-old woman presents to a clinic with a left thalamic arteriovenous malformation (AVM). The lesion appears to be ~5 cm in its greatest dimension. The AVM drains exclusively to the deep venous system via several stenotic veins. How would one best grade this AVM?
- **A.** Spetzler-Martin grade 3
- **B.** Spetzler-Martin grade 3A
- **C.** Spetzler-Martin grade 4
- **D.** Spetzler-Martin grade 4A
- **E.** Spetzler-Martin grade 5

263. Which type of breathing pattern is associated with a dorsomedial lesion in the medulla?
- **A.** apneustic
- **B.** Biot
- **C.** central neurogenic hyperventilation
- **D.** Kussmaul
- **E.** Cheyne-Stokes

264. Which of the following structures is supplied mainly by the anterior choroidal artery?
- **A.** globus pallidus externa, posterior limb of the internal capsule
- **B.** globus pallidus interna, posterior limb of the internal capsule
- **C.** globus pallidus externa, anterior limb of the internal capsule
- **D.** globus pallidus interna, anterior limb of the internal capsule
- **E.** none of the above

265. A feature that distinguishes pronator teres syndrome from carpal tunnel syndrome is that the former
- **A.** is due to repetitive usage.
- **B.** causes aching and fatiguing of the muscles involved.
- **C.** causes nocturnal exacerbations.
- **D.** exhibits numbness in the palm area.
- **E.** is a better candidate for surgery.

266. Bleeding time is increased by all of the following EXCEPT:
- **A.** thrombocytopenia
- **B.** uremia
- **C.** factor XIII deficiency
- **D.** vWF deficiency
- **E.** NSAIDs

267. Which of the following is a paired structure?
- **A.** subforniceal organ
- **B.** subcommissural organ
- **C.** area postrema
- **D.** all of the above
- **E.** none of the above

268. Which of the following taste sensations is coupled to G-proteins when activated?
- **A.** sweet and sour
- **B.** sweet and bitter
- **C.** bitter and salty
- **D.** sour only
- **E.** salty only

269. A patient states that he has a sharp electric-like pain that begins when he touches the lower side of his nose. The pain then shoots down into the cheek, then up above the eye. Which of the following divisions should be treated?

A. V_1 only
B. V_2 only
C. V_3 only
D. V_2 and V_3
E. V_1, V_2, and V_3

270. Gerstmann's syndrome classically includes all the following EXCEPT:

A. dysgraphia
B. left-right confusion
C. finger agnosia
D. dyscalculia
E. astereognosis

271. A 50-year-old man is seen in a clinic 6 months after being involved in a motor vehicle accident. He has noticed a palpable lump growing on the left side of his head (see x-ray). On examination, the lesion is painless when palpated. Which of the following lesions is most likely?

A. fibrous dysplasia
B. osteoma
C. eosinophilic granuloma
D. giant cell tumor
E. epidermoid

272. Which of the following cranial nerves exit the brainstem between the pyramid and the olive?
- **A.** cochlear
- **B.** glossopharyngeal
- **C.** vagus
- **D.** accessory
- **E.** hypoglossal

273. All of the following regarding stage 4 sleep are true EXCEPT:
- **A.** Dreaming occurs.
- **B.** Nightmares occur.
- **C.** It is of decreased duration with hypothyroidism.
- **D.** Somnambulism occurs.
- **E.** It is of increased duration after sleep deprivation.

274. Increased risk of hemorrhage from warfarin is seen
- **A.** with phenobarbital.
- **B.** with carbamazepine.
- **C.** with cephalosporins.
- **D.** with penicillin.
- **E.** with all of the above

275. Which of the following muscles are typically involved in anterior interosseous syndrome?
- **A.** flexor digitorum profundus
- **B.** flexor pollicis longus
- **C.** pronator quadratus
- **D.** all of the above
- **E.** none of the above

276. At surgery for a petrous tumor, brisk venous bleeding is encountered at this step in the procedure (see intraoperative image). What vascular structure is the most likely cause of this bleeding?

A. inferior petrosal sinus
B. jugular bulb
C. sigmoid sinus
D. transverse sinus
E. PICA

277. Which of the following has an intact blood–brain barrier (BBB)?
A. subforniceal organ
B. subcommissural organ
C. area postrema
D. all of the above
E. none of the above

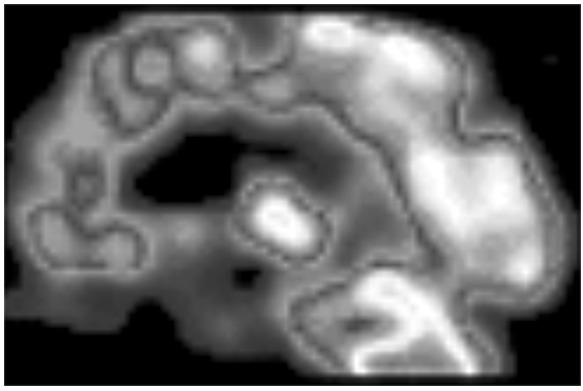
278. Dysgeusia is often associated with the use of
A. penicillin.
B. captopril.
C. steroids.
D. all of the above
E. none of the above

279. A 42-year-old man complains of a several week history of hand numbness and clumsiness. Today he presents with severe headache and neck stiffness (see imaging). What would be the best mode of treatment for the lesion depicted in the angiogram?

A. observation
B. surgical excision
C. gamma knife
D. partial surgical treatment
E. embolization

280. Which of the following is NOT associated with chronic alcoholism?
A. cerebral atrophy
B. Wernicke encephalopathy
C. central pontine myelinolysis
D. Foster-Kennedy syndrome
E. Marchiafava-Bignami disease

281. The patient is a 56-year-old man with mental status changes over the past several months. His wife states that he has lost his job because he was acting inappropriately. He saw a neurologist last week who conducted a SPECT study (see imaging). From the results of this study, what is the cause of the dementing illness?



A. early Alzheimer's disease
B. Pick's disease
C. Creutzfeldt-Jakob disease
D. Huntington's disease
E. diffuse Lewy body dementia

282. All of the following statements about fibrillation potentials are true EXCEPT:
A. They are a triphasic potential.
B. They typically last 5 to 15 milliseconds.
C. They are caused by denervation.
D. They are seen with poliomyelitis, ALS, and peripheral nerve injury.
E. They may be associated with positive sharp waves.

283. Bursts of 13 Hz lasting from half a second to 2 seconds are characteristic
A. of stage 1 sleep.
B. of stage 2 sleep.
C. of stage 3 sleep.
D. of stage 4 sleep.
E. of REM sleep.

284. During dissection for clipping of a large basilar artery aneurysm, a large bony protrusion is seen blocking the neck of the aneurysm (see intraoperative picture). What is this bony promontory?

A. petrous bone
B. hyperostosis
C. anterior clinoid process
D. posterior clinoid process
E. petrous bone

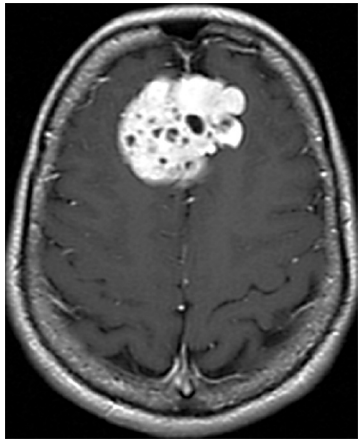
285. The transverse scapular ligament may be the cause of an entrapment syndrome that results in shoulder pain and muscle atrophy. The nerve that is trapped is
A. a direct branch of the C5 root.
B. a branch from the middle trunk.
C. a branch from the posterior cord.
D. a branch from the superior trunk.
E. none of the above

286. Which of the following cranial nerves travel through medial lemniscal fibers on exiting the brainstem?
A. III
B. IV
C. VI
D. VII
E. XII

287. Normal cerebral blood flow is
A. 50 mL/100 mg/min.
B. 50 mL/100 g/min.
C. 50 mL/mg/min.
D. 50 mL/g/min.
E. 50 mL/kg/min.

288. Which of the following disorders is/are associated with gustatory dysfunction?
- **A.** Bell's palsy
- **B.** familial dysautonomia
- **C.** Raeder's paratrigeminal syndrome
- **D.** all of the above
- **E.** none of the above

289. Total excision of the lesion shown in the imaging is most likely to improve



- **A.** attention.
- **B.** memory.
- **C.** visuoconstructive ability.
- **D.** executive function.
- **E.** cognitive function.

290. Which of the following is caused by the JC virus?
- **A.** central pontine myelinolysis (CPM)
- **B.** progressive multifocal leukoencephalopathy (PML)
- **C.** bovine spongiform encephalitis (BSE)
- **D.** Creutzfeldt-Jakob disease (CJD)
- **E.** none of the above

291. During saccadic movement of the eyes
- **A.** there is increased activity of STN (subthalamic) neurons.
- **B.** there is increased activity of SNpr (pars reticulata) neurons.
- **C.** there is decreased activity of SNpr neurons.
- **D.** there is increased activity of GPe (globus pallidus pars externa) neurons.
- **E.** none of the above

292. All the following are true statements regarding fasciculation potentials EXCEPT:
- **A.** They have three to five phases.
- **B.** They last from 5 to 15 milliseconds.
- **C.** They are associated with nerve fiber irritability.
- **D.** They are not visible through the skin.
- **E.** They may be associated with hypocalcemia, hypothermia, and nerve entrapments.

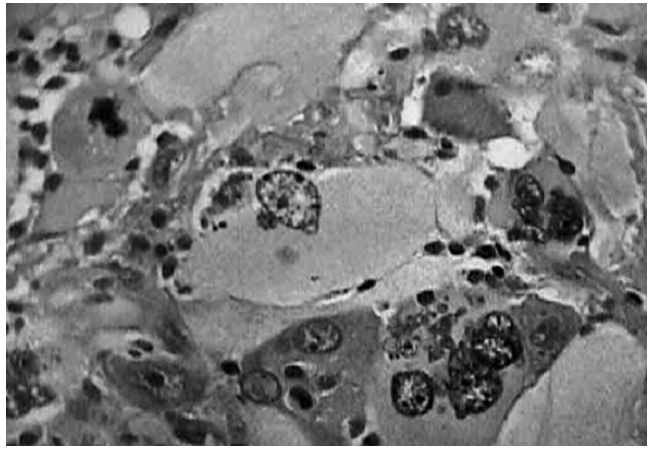
293. Calexcitin is a signaling molecule that amplifies calcium elevation in response to learning-associated synaptic transmitters in a model system of learning and memory (marine snail *Hermissenda*). Which of the following is FALSE regarding calexcitin?
- **A.** Neural mechanisms regarding associative learning rarely are conserved between different species.
- **B.** Calexcitin binds guanosine triphosphate (GTP), which is important in cell signaling.
- **C.** At the endoplasmic reticulum membrane, it has been shown to bind to the ryanodine receptor with high affinity.
- **D.** Calexcitin directly inactives voltage-dependent potassium currents.
- **E.** It is a high-affinity substrate for the α-isozyme of protein kinase C (PKC).

294. Which of the following has been described with oat cell carcinoma of the lung?
- **A.** anti-Hu antibodies
- **B.** Eaton-Lambert syndrome and limbic encephalitis
- **C.** ectopic ACTH secretion
- **D.** syndrome of inappropriate secretion of antidiuretic hormone (SIADH)
- **E.** all of the above

295. On an EKG, a J-point elevation is characteristic of
- **A.** hypocalcemia.
- **B.** hypokalemia.
- **C.** hypothermia.
- **D.** hypothyroidism.
- **E.** subendocardial ischemia.

296. Which of the following encephaloceles have the greatest chance of normal intellectual development and are least likely to develop hydrocephalus?
- **A.** anterior encephaloceles
- **B.** parietal encephaloceles
- **C.** basal encephaloceles
- **D.** occipital encephaloceles
- **E.** encephaloceles of the clivus

297. The brain tumor shown in this pathology slide expresses a high frequency of this mutation.



A. TP53
B. PTEN
C. EGFR
D. all of the above
E. none of the above

298. Which of the following may be features of anaplastic oligodendroglioma?
A. microvascular proliferation
B. necrosis
C. pseudopalisading
D. all of the above
E. none of the above

299. Which structure straddles the posterior reach of the sylvian fissure?
A. angular gyrus
B. supramarginal gyrus
C. middle temporal gyrus
D. superior parietal lobule
E. none of the above

300. Avellis' syndrome is most likely caused by a lesion in which area?
A. medulla
B. pons
C. hypothalamus
D. thalamus
E. midbrain

301. Bicuculline is
- **A.** a glutamate agonist.
- **B.** a glutamate antagonist.
- **C.** a dopamine agonist.
- **D.** a GABA agonist.
- **E.** a GABA antagonist.

302. All of the following statements regarding Charcot-Marie-Tooth (CMT) disease are true EXCEPT:
- **A.** It may be associated with a footdrop.
- **B.** It is a condition of disordered myelination from decreased production of PMP22 (peripheral myelin protein).
- **C.** It is the most common inherited peripheral neuropathy.
- **D.** It is associated with a mutation on chromosome 17.
- **E.** It is characterized by peroneal muscle atrophy.

303. Neurons that give rise to the ventral trigeminothalamic tract arise
- **A.** from the trigeminal motor nucleus and the spinal trigeminal tract.
- **B.** from the dorsal aspect of the principle sensory nucleus and the spinal trigeminal tract.
- **C.** from the ventral aspect of the principle sensory nucleus and the spinal trigeminal tract.
- **D.** from the ventral aspect of the principle sensory nucleus and the mesencephalic tract.
- **E.** from the dorsal aspect of the principle sensory nucleus and the mesencephalic tract.

304. All of the following regarding motion perception is true EXCEPT:
- **A.** Motion is perceived by an object's change of position on the retina.
- **B.** The sensation of movement is known as the phi phenomenon.
- **C.** Images that change positions more than 15 times per second are indistinguishable from continuous motion.
- **D.** The motion system is disabled at rates above 50 Hz.
- **E.** There is no physical process occurring on the retina that corresponds to the perceived sensation of motion.

305. Which tract decussates in the dorsal tegmental decussation?
- **A.** rubrospinal tract
- **B.** medial vestibulospinal tract
- **C.** tectospinal tract
- **D.** all of the above
- **E.** none of the above

306. In paranasal sinus cancers, sphenoid sinus involvement is noteworthy since it
- **A.** is the major predictor of later tumor recurrence.
- **B.** demands use of special instruments.
- **C.** will more likely result in anosmia postoperatively.
- **D.** all of the above
- **E.** none of the above

307. Which of the following is a distinct interneuron between receptor and ganglion cell?
- **A.** rods
- **B.** cones
- **C.** horizontal cells
- **D.** amacrine cells
- **E.** bipolar cells

308. Ependymoma is immunoreactive
- **A.** for GFAP.
- **B.** for S-100.
- **C.** for vimentin.
- **D.** for all of the above
- **E.** for none of the above

309. The caudal remnant of the median prosencephalic vein unites with the developing internal cerebral veins to form
- **A.** the straight sinus.
- **B.** the vein of Galen.
- **C.** the confluence of sinuses.
- **D.** the inferior sagittal sinus.
- **E.** none of the above

310. Which of the following statements is NOT true of Pelizaeus-Merzbacher disease (PMD)?
- **A.** It has been linked to severe deficiency of myelin specific lipids.
- **B.** It is X-linked recessive in the classical form.
- **C.** The connatal form (type II) is milder than the classical form.
- **D.** It manifests as a "tigroid" pattern of perivascular myelin preservation on MRI.
- **E.** Rare female cases have been described.

311. Which afferent cerebellar tract does NOT pass through the inferior cerebellar peduncle?
- **A.** reticulocerebellar
- **B.** vestibulocerebellar
- **C.** trigeminocerebellar
- **D.** pontocerebellar tract
- **E.** olivocerebellar tract

312. All of the following statements regarding the cerebellum are true EXCEPT:
- **A.** The floccular-nodular lobe receives input from the vestibular nuclei.
- **B.** The anterior lobe receives input from the spinocerebellar tracts.
- **C.** The vermis sends fibers to the VL thalamus and motor cortex.
- **D.** The intermediate zone functions with posture, tone, and ipsilateral limb movements.
- **E.** A lesion of the interposed nuclei causes intention tremor.

313. Which of the following inhibitory synaptic connections is found exclusively in the olfactory bulb?
- **A.** dendrodendritic
- **B.** axodendritic
- **C.** axoaxonic
- **D.** axosomatic
- **E.** dendroaxonic

314. Which of the following statements is FALSE regarding the parvocellular system of the lateral geniculate nucleus?
- **A.** It is a small cell with a compact dendritic tree.
- **B.** It represents a minority of the total ganglion cell number.
- **C.** It projects to layer 4Cβ in the striate cortex.
- **D.** It is involved with color processing.
- **E.** It has low contrast sensitivity and high acuity.

315. All the following are true regarding venous air embolism EXCEPT:
- **A.** It manifests as a decrease in end tidal CO_2.
- **B.** Air should be aspirated from the right atrium if it occurs.
- **C.** The patient should be placed in the left lateral decubitus position.
- **D.** The head should be lowered if possible.
- **E.** End tidal CO_2 changes cannot precede precordial Doppler changes.

316. The stria terminalis is a fiber tract that parallels
- **A.** the caudate vein.
- **B.** the septal vein.
- **C.** the basal vein of Rosenthal.
- **D.** the internal cerebral vein.
- **E.** the thalamostriate vein.

317. What are the major contents of the proximal portion of the cubital fossa, in order from medial to lateral?
- **A.** median nerve, brachial artery, biceps brachii tendon, radial nerve
- **B.** median nerve, biceps brachii tendon, radial nerve, brachial artery
- **C.** biceps brachii tendon, median nerve, radial nerve, brachial artery
- **D.** brachial artery, biceps brachii tendon, radial nerve, median nerve
- **E.** none of the above

318. All of the following are medial rotators of the arm EXCEPT:
- **A.** the pectoralis major
- **B.** the subscapularis
- **C.** the teres major
- **D.** the teres minor
- **E.** the latissimus dorsi

319. The medial posterior choroidal artery when viewed on an angiogram occupies the same location as this structure seen on the venous phase of the angiogram.
- **A.** vein of Galen
- **B.** basal vein of Rosenthal
- **C.** internal cerebral vein
- **D.** thalamostriate vein
- **E.** caudate vein

320. Occlusion of which of the following arteries is most likely to result in ipsilateral hypoglossal palsy?
- **A.** basilar
- **B.** anterior spinal
- **C.** vertebral
- **D.** PICA
- **E.** AICA

321. The Botzinger complex is a cluster of cells that is involved in
- **A.** excitatory control of cardiac function.
- **B.** inhibitory control of cardiac function.
- **C.** excitatory control of respiratory function.
- **D.** inhibitory control of respiratory function.
- **E.** none of the above

322. The upper subscapular nerve arises from which segment of the brachial plexus?
- **A.** superior trunk
- **B.** medial trunk
- **C.** lateral cord
- **D.** posterior cord
- **E.** medial cord

323. All of the following are true of Moyamoya syndrome EXCEPT:
- **A.** The majority of adults with this disease present with ischemia.
- **B.** The age of onset of symptoms displays a bimodal distribution.
- **C.** It is of unknown etiology.
- **D.** Involves progressive stenosis of the supraclinoid carotid arteries with the concomitant formation of rich collaterals at the skull base.
- **E.** It is associated with Down syndrome and neurofibromatosis.

324. All of the following are true of valproic acid EXCEPT:
- **A.** It is effective in generalized tonic clonic seizures.
- **B.** It is ~90% protein bound.
- **C.** It has a long half-life.
- **D.** It may be associated with platelet dysfunction.
- **E.** It may result in liver dysfunction.

325. Which of the following anesthetics allows patients to emerge faster from anesthesia and has the least effect on metabolism of antiepileptic drugs?
- **A.** enflurane
- **B.** isoflurane
- **C.** nitrous oxide
- **D.** halothane
- **E.** ketamine

326. The glomus is a prominent tuft of choroid plexus found
- **A.** in the frontal horn.
- **B.** in the temporal horn.
- **C.** in the atrium.
- **D.** in the occipital horn.
- **E.** in none of the above

327. Which of the following groups of nerves is most likely to be affected by fractures of the humerus?
- **A.** axillary, musculocutaneous
- **B.** median, musculocutaneous
- **C.** axillary, radial, ulnar
- **D.** median, radial, ulnar
- **E.** median, radial

328. Apraxia usually results from a lesion
- **A.** of the precentral gyrus.
- **B.** of the postcentral gyrus.
- **C.** of the premotor cortex.
- **D.** of the prefrontal cortex.
- **E.** of the cingulate gyrus.

329. On an angiogram, the colliculocentral point is halfway between the tuberculum sellae and the sinus confluence. This point is closest to which structure?
- **A.** vein of Galen
- **B.** basal vein of Rosenthal
- **C.** internal cerebral vein
- **D.** straight sinus
- **E.** precentral cerebellar vein

330. Theta activity can be described for which of the following frequencies?
- **A.** 5 Hz
- **B.** 10 Hz
- **C.** 15 Hz
- **D.** 20 Hz
- **E.** 25 Hz

331. Cells of which area have true unipolar neurons?
- **A.** motor nucleus of V (trigeminal)
- **B.** mesencephalic nucleus of V
- **C.** sensory nucleus of V
- **D.** red nucleus
- **E.** locus ceruleus

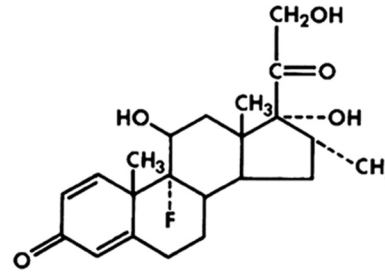
332. The spinal border cells found in the ventral horns at L1-S2 give rise
- **A.** to first-order neurons of the ventral spinocerebellar tract.
- **B.** to second-order neurons of the ventral spinocerebellar tract.
- **C.** to first-order neurons of the dorsal spinocerebellar tract.
- **D.** to second-order neurons of the dorsal spinocerebellar tract.
- **E.** none of the above

333. Narcolepsy is associated with
- **A.** HLA-B27.
- **B.** HLA-A24.
- **C.** HLA-B40.
- **D.** HLA-B54.
- **E.** HLA-DR2.

334. Both retrospective and prospective studies of anterior temporal lobectomy have shown that seizure control in medial temporal lobe epilepsy is related to the extent of
- **A.** anterior resection.
- **B.** posterior resection.
- **C.** lateral resection.
- **D.** medial resection.
- **E.** none of the above

335. Overall, the most common cause of chorea is
- **A.** Huntington's chorea.
- **B.** chorea gravidarum.
- **C.** senile chorea.
- **D.** Hysterical chorea.
- **E.** Sydenham's chorea.

336. Side effects of this medication include



A. myopathy.
B. susceptibility to infection.
C. posterior subcapsular cataracts.
D. all of the above
E. none of the above

337. Which of the following is true concerning relationships to the flexor retinaculum?
A. The ulnar artery is superficial to it.
B. The median nerve is deep to it.
C. The ulnar nerve is superficial to it.
D. all of the above
E. none of the above

338. If a patient has already had a thalamotomy for tremor and now seeks treatment for tremor of the other hand, which deep brain stimulation (DBS) procedure should be done?
A. thalamotomy
B. Vim stimulation
C. GPi stimulation
D. any of the above is a reasonable choice
E. none of the above

339. Temozolomide is a novel chemotherapeutic agent approved for use in treating
A. meningioma.
B. glioblastoma multiforme.
C. anaplastic astrocytoma.
D. ependymomas.
E. choroid plexus carcinoma

340. The H-reflex is most useful to assess
- **A.** polyneuropathy.
- **B.** cervical radiculopathy.
- **C.** myopathy.
- **D.** S1 radiculopathy.
- **E.** median nerve compression.

341. Which of the following is NOT a normal phenomenon in the aging neuron?
- **A.** lipofuscin accumulation
- **B.** Lewy bodies
- **C.** Marinesco bodies
- **D.** Alzheimer changes
- **E.** colloid inclusions

342. A patient is asked to close his or her eyes during the neurologic exam and the doctor places a key in the patient's hand. The ability of the patient to tell what the object is depends on the integrity of which pathway?
- **A.** dorsal column
- **B.** spinospinal
- **C.** ventral spinocerebellar
- **D.** dorsal spinocerebellar
- **E.** spinothalamic

343. All of the following are true regarding intracranial pressure monitoring EXCEPT:
- **A.** Pressure gradients between left and right sides of the brain and supra- and infratentorial compartments may be present.
- **B.** The incidence of hemorrhage after insertion is about 1%.
- **C.** Irrigating the tubing decreases the contamination rate of ventricular catheters.
- **D.** Decreased intracranial compliance is suggested when the "b wavelet" is greater than the "a wavelet."
- **E.** There is no clear consensus as to whether to use prophylactic antibiotics.

344. Which of the following is a FALSE statement regarding the corticospinal tract?
- **A.** In the pyramidal decussation, arm areas of cortex cross rostral to those that arise from leg areas.
- **B.** It receives contributions from somatomotor cortex, prefrontal regions, and parietal areas.
- **C.** Glutamate is present in cortical efferent fibers that project to the spinal cord.
- **D.** Leg fibers are lateral to arm fibers at most levels of this particular tract.
- **E.** Area 4 and postcentral gyrus fibers terminate in the same spinal cord lamina.

345. The middle cerebral artery supplies all of the following structures EXCEPT:
- **A.** inferior parietal lobule
- **B.** Broca's area
- **C.** Wernicke's area
- **D.** primary auditory cortex
- **E.** paracentral lobule

346. During a transcallosal approach to a tumor, the risk of left hemialexia is minimized by preserving
- **A.** the genu of the corpus callosum.
- **B.** the cingulate gyrus.
- **C.** the pericallosal artery.
- **D.** the splenium of the corpus callosum.
- **E.** none of the above

347. The clivoaxial angle is normally about
- **A.** 13 degrees.
- **B.** 30 degrees.
- **C.** 100 degrees.
- **D.** 130 degrees.
- **E.** 180 degrees.

348. The sensorimotor region is located in which part of the GPi?
- **A.** anteromedial
- **B.** anterolateral
- **C.** posteromedial
- **D.** posterolateral
- **E.** none of the above

349. The following lesion is resected from the lumbar spine. Which of the following statements is FALSE?

A. The majority of these lesions arise from a ventral nerve root.
B. Ten to 15% extend through the dural root sleeve.
C. The fourth through sixth decades represent the peak incidence of occurrence.
D. These masses are typically described as smooth, globoid, and do not produce enlargement of the nerve.
E. They are suspended eccentrically from the nerve root with a discrete attachment.

350. Which of the following is particular to type I muscle fibers?
A. anaerobic
B. fast
C. stain dark with ATPase at pH 9.4
D. found in red muscle
E. have few mitochondria

351. Which of the following pathologic inclusions is intranuclear?
A. Pick bodies
B. Lewy bodies
C. Cowdry type B bodies
D. Bunina bodies
E. Lafora bodies

352. All of the following tracts decussate EXCEPT:
- **A.** lateral spinothalamic
- **B.** ventral spinocerebellar
- **C.** ventral corticospinal
- **D.** dorsal spinocerebellar
- **E.** ventral spinothalamic

353. Which of the following is most accurate about Meniere's disease?
- **A.** Nystagmus is horizontal and ipsilateral to the affected side.
- **B.** Nystagmus is vertical.
- **C.** Falling and past-pointing are contralateral.
- **D.** Nystagmus is contralateral to the affected side.
- **E.** none of the above

354. Which of the following thalamic nuclei has reciprocal connections with the inferior parietal lobule?
- **A.** pulvinar
- **B.** anterior nucleus
- **C.** centromedian nucleus
- **D.** VA nucleus
- **E.** VL nucleus

355. Visual-verbal disconnection syndrome is most likely to be seen with sectioning
- **A.** of the anterior commissure.
- **B.** of the hippocampal commissure.
- **C.** of the body of the corpus callosum.
- **D.** of the genu of the corpus callosum.
- **E.** of the splenium of the corpus callosum.

356. Pineal tumors usually displace the precentral cerebellar vein
- **A.** anterosuperiorly.
- **B.** posterosuperiorly.
- **C.** anteroinferiorly.
- **D.** posteroinferiorly.
- **E.** none of the above

357. Which of the following structures can be found two thirds of the way from the vomer to the foramen magnum?
- **A.** occipital condyle
- **B.** inion
- **C.** pharyngeal tubercle
- **D.** pituitary gland
- **E.** sphenoid sinus

358. Which of the following arteries supply choroid plexus?
- **A.** posterior inferior cerebellar artery
- **B.** posterior cerebral artery
- **C.** anterior choroidal artery
- **D.** all of the above
- **E.** none of the above

359. Platelet activation results in an increased affinity of the glycoprotein IIb/IIIa receptor for binding
- **A.** of fibrinogen.
- **B.** of thrombin.
- **C.** of factor V.
- **D.** of factor VIII.
- **E.** of factor X.

360. Which statement regarding hepatolenticular degeneration disease is FALSE?
- **A.** Serum ceruloplasmin is low.
- **B.** Urinary copper is increased.
- **C.** The gene locus is on chromosome 13.
- **D.** Inheritance is autosomal dominant.
- **E.** Early in the course of the disease, liver biopsy shows a high copper content.

361. Which of the following is FALSE regarding Bergmann glia?
- **A.** They serve as guides for migrating granular cell neurons during development.
- **B.** They have cell bodies located in the molecular layer of the cerebellar cortex.
- **C.** They undergo reactive gliosis adjacent to infarcts.
- **D.** They extend long cytoplasmic processes through the molecular layer to the subpial surface.
- **E.** They are inconspicuous until stimulated by local damage.

362. A 62-year-old male presents with cauda equina syndrome from a herniated disc. All of the following statements are true EXCEPT:
- **A.** signs are frequently unilateral
- **B.** classically involves spinal roots inferior to L3
- **C.** may result in profound motor defects
- **D.** may result in urinary or fecal incontinence
- **E.** usually results in a Babinski sign

363. The vestibule contains
- **A.** the kinetic labyrinth.
- **B.** the ampullae.
- **C.** the static labyrinth.
- **D.** the cochlear duct.
- **E.** none of the above

364. The ipsilateral central tegmental tract gives projections to which nucleus of the thalamus?
- **A.** VA
- **B.** VL
- **C.** VPL
- **D.** VPM
- **E.** none of the above

365. A meningioma located at the lateral tentorial notch with major extension infratentorially would be best managed
- **A.** with a lateral suboccipital retrosigmoid approach.
- **B.** with a combined subtemporal presigmoid approach.
- **C.** with a infratentorial supracerebellar approach.
- **D.** with a suboccipital transtentorial approach.
- **E.** with none of the above approaches

366. Pineal calcifications are considered abnormal if encountered in patients younger than
- **A.** 6 years.
- **B.** 12 years.
- **C.** 18 years.
- **D.** 26 years.
- **E.** 30 years.

367. Which of the following ligaments is found between the anterior tubercle of the atlas and the dens?
- **A.** anterior longitudinal ligament
- **B.** posterior longitudinal ligament
- **C.** alar ligament
- **D.** transverse ligament
- **E.** none of the above

368. The most frequent site for a subependymoma is
- **A.** the third ventricle.
- **B.** the fourth ventricle.
- **C.** the left lateral ventricle.
- **D.** the right lateral ventricle.
- **E.** the septum pellucidum.

369. The lamina terminalis is continuous
- **A.** with the anterior commissure.
- **B.** with the fornix.
- **C.** with the splenium of the corpus callosum.
- **D.** with the mammillary body.
- **E.** with the pineal gland

370. Damage to Brodmann area 8 on the right results
- **A.** in both eyes being deviated to the right at rest.
- **B.** in both eyes being deviated to the left at rest.
- **C.** in the right eye being "down-and-out."
- **D.** in the patient being unable to look upward.
- **E.** in both eyes being deviated upward.

371. Immunoreactivity to transthyretin and S-100 would most likely be seen
- **A.** in oligodendroglioma.
- **B.** in low-grade astrocytoma.
- **C.** in pleomorphic xanthoastrocytoma.
- **D.** in choroid plexus papilloma.
- **E.** in schwannoma.

372. EEG activity becomes isoelectric at a cerebral blood flow
- **A.** of 7 mL/100 g/min.
- **B.** of 16 mL/100 g/min.
- **C.** of 30 mL/100 g/min.
- **D.** of 35 mL/100 g/min.
- **E.** of 45 mL/100 g/min.

373. All of the following are true regarding the lateral vestibulospinal tract EXCEPT:
- **A.** It arises from the ipsilateral Deiter's nucleus.
- **B.** It is located in the lateral pontine tegmentum.
- **C.** It crosses the midline with medial longitudinal fasciculus (MLF) fibers.
- **D.** It facilitates extensor muscle tone in the antigravity muscles.
- **E.** It is found at all spinal cord levels.

374. Lesions of this thalamic nucleus are found in patients with Korsakoff's amnestic state.
- **A.** anterior nucleus
- **B.** centromedian nucleus
- **C.** pulvinar
- **D.** VA
- **E.** mediodorsal nucleus

375. Before one transects the tentorium, which cranial nerve must be identified?
- **A.** III
- **B.** IV
- **C.** V
- **D.** VI
- **E.** VII

376. All the following statements regarding germ cell tumors are true EXCEPT:
- **A.** They are the most common pineal region neoplasm.
- **B.** They occur predominantly in males.
- **C.** They commonly occur at around age 40 and above.
- **D.** They are 5 to 10 times more likely in Japan.
- **E.** They are infiltrated by T-cell lymphocytes.

377. All of the following regarding CNS sarcoid are true EXCEPT:
- **A.** It is sensitive to steroids.
- **B.** It may mimic multiple sclerosis.
- **C.** It can involve cranial nerves.
- **D.** It is characterized pathologically by caseating granulomas.
- **E.** Leptomeningeal involvement is common.

378. Which of the following is the most frequent brain tumor in the first year of life?
- **A.** choroid plexus tumor
- **B.** gliosarcoma
- **C.** cystic astrocytoma
- **D.** oligodendroglioma
- **E.** glioblastoma multiforme

379. A "square" anterior cerebral artery (ACA) shift on a cerebral angiogram suggests that there may most likely be a mass in which area?
- **A.** frontal lobe
- **B.** temporal lobe
- **C.** parietal lobe
- **D.** occipital lobe
- **E.** basal ganglia

380. The motor nucleus of the trigeminal nerve is located
- **A.** in the upper midbrain.
- **B.** in the lower midbrain.
- **C.** in the upper pons.
- **D.** in the middle pons.
- **E.** in the lower pons.

381. Circumventricular organs include all of the following EXCEPT:
- **A.** obex
- **B.** subcommissural organ
- **C.** median eminence
- **D.** organum vasculosum of the lamina terminalis
- **E.** area postrema

382. Hyponatremia is most likely a direct cause of subarachnoid hemorrhage (SAH) from rupture of which of the following aneurysms?
- **A.** pericallosal
- **B.** anterior communicating
- **C.** posterior communicating
- **D.** middle cerebral
- **E.** superior hypophyseal

383. All of the following are true statements of the posterior inferior cerebellar artery (PICA) EXCEPT:
- **A.** It is a branch of the vertebral artery.
- **B.** It supplies the vestibular nuclei in the medulla.
- **C.** It supplies the medial lemniscus in the medulla.
- **D.** It supplies the inferior cerebellar peduncle.
- **E.** It supplies the lateral spinothalamic tract.

384. The optic disk
- **A.** is located lateral to the fovea.
- **B.** contains myelinated axons from the retinal ganglion cell layer of the retina.
- **C.** contains only cones.
- **D.** all of the above
- **E.** none of the above

385. Which muscle is the border of the superior and inferior suboccipital triangles?
- **A.** rectus capitis posterior major
- **B.** superior obliquus capitis
- **C.** inferior obliquus capitis
- **D.** longissimus capitis
- **E.** none of the above

386. The key to translabyrinthine dissection is anatomic identification
- **A.** of the trigeminal nerve.
- **B.** of the abducens nerve.
- **C.** of the facial nerve.
- **D.** all of the above
- **E.** none of the above

387. All of the following are true of thoracic spine meningiomas EXCEPT:
- **A.** The great majority of spinal meningiomas occur in females.
- **B.** The most common presenting symptom is pain.
- **C.** Plain film calcification is often seen.
- **D.** Inversion recovery sequences and use of gadolinium increase detection sensitivity.
- **E.** Calcospheres may be seen.

388. Damage to the posterior cord of the brachial plexus results in paralysis of all of the following muscles EXCEPT:
- **A.** teres minor
- **B.** teres major
- **C.** latissimus dorsi
- **D.** subscapularis
- **E.** infraspinatus

389. Which of the following statements is NOT TRUE regarding radiation injury after stereotactic radiosurgery?
- **A.** Time of development is directly related to the rate of turnover of the cells.
- **B.** Cell loss after radiation occurs in connection with the cell division.
- **C.** Time of development is directly dependent on the radiation dose.
- **D.** Slowly proliferating tissue like CNS may take years to show the effects.
- **E.** It can be minimized with careful dose planning.

390. Inherited mitochondrial disorders include all of the following EXCEPT:
- **A.** Leigh's disease
- **B.** MERFF
- **C.** MELAS
- **D.** Kearns-Sayre syndrome
- **E.** Kawasaki disease

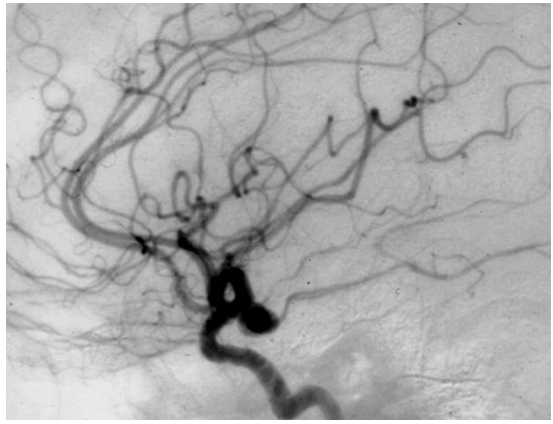
391. Chromosomal alterations that are known to occur in tumors include all of the following EXCEPT:
- **A.** Loss of heterozygosity (LOH) at 1p and 19q in oligodendrogliomas
- **B.** LOH at 22 in ependymomas
- **C.** LOH at 17 in astrocytomas
- **D.** Monosomy of 22 in ATRT
- **E.** Amplification of N-*myc* in glioblastoma

392. During routine preoperative screening for meningioma excision, the single greatest contraindication to surgery would be
- **A.** myocardial infarction within the last 6 months.
- **B.** age greater than 75.
- **C.** greater than five ventricular ectopic beats per minute.
- **D.** smoking more than one pack of cigarettes a day.
- **E.** being hepatitis C positive.

393. All of the following tracts pass through the inferior cerebellar peduncle EXCEPT:
- **A.** dorsal spinocerebellar
- **B.** cuneocerebellar
- **C.** fastigiovestibular
- **D.** olivocerebellar
- **E.** vestibulocerebellar

394. A lower altitudinal hemianopia is the result
- **A.** of unilateral destruction of the cuneus.
- **B.** of bilateral destruction of both cunei.
- **C.** of unilateral destruction of the lingual gyrus.
- **D.** of bilateral destruction of both lingual gyri.
- **E.** none of the above

395. During clipping of the following unruptured aneurysm, what is the best maneuver to minimize rupture?



- **A.** temporary clipping of the carotid in the neck
- **B.** lumbar drainage
- **C.** preoperative use of steroids
- **D.** keeping the patient intubated until surgery
- **E.** minimal retraction

396. The reasons for monitoring wave 5 during acoustic neuroma surgery include:
- **A.** It is an indication of the activity peripheral to the tumor.
- **B.** It is easier to detect than the other waves.
- **C.** Wave 5 is an accurate predictor of hearing postoperatively regardless of N1.
- **D.** all of the above
- **E.** none of the above

397. All of the following are true of multiple sclerosis EXCEPT:
- **A.** Axons are intact.
- **B.** Unidentified bright objects (UBOs) may be seen on MRI.
- **C.** Active lesions show contrast enhancement.
- **D.** Initial symptoms are referable to motor function.
- **E.** About 10% have a positive family history.

398. All of the following are structures of the circuit of Papez EXCEPT:
- **A.** anterior thalamus
- **B.** cingulated gyrus
- **C.** fornix
- **D.** hippocampus
- **E.** dorsomedial thalamus

399. The neurosurgeon accredited with developing modern-day stereotactic radiosurgery is
- **A.** M. Gazi Yasargil.
- **B.** Harvey Cushing.
- **C.** Lars Leksell.
- **D.** Walter Dandy.
- **E.** Wilder Penfield.

400. A nonfluent, expressive aphasia can result from damage to
- **A.** Brodmann area 40.
- **B.** Brodmann area 41.
- **C.** Brodmann area 42.
- **D.** Brodmann area 43.
- **E.** Brodmann area 44.

401. Elevated levels of *N*-acetyl aspartic acid in the urine and CSF is seen
- **A.** in adrenoleukodystrophy.
- **B.** in Canavan's disease.
- **C.** in Alexander's disease.
- **D.** in Krabbe's disease.
- **E.** in metachromatic leukodystrophy.

402. The most commonly observed platelet dysfunction encountered in surgical patients
- **A.** is due to hemophilia A.
- **B.** is due to factor V deficiency.
- **C.** is due to aspirin.
- **D.** is due to heparin.
- **E.** is due to vitamin K deficiency.

403. All of the following are RNA viruses EXCEPT:
- **A.** poxvirus
- **B.** picornavirus
- **C.** paramyxovirus
- **D.** reovirus
- **E.** rhabdovirus

404. Hematoporphyrin derivative (HPD) is used
- **A.** in radiotherapy.
- **B.** in chemotherapy.
- **C.** in gene therapy.
- **D.** in photochemotherapy.
- **E.** none of the above

405. The most sensitive cranial nerve to radiation is
- **A.** I
- **B.** II
- **C.** III
- **D.** IV
- **E.** V

406. The mastoid emissary vein is a useful guide to approximate the location
- **A.** of the junction of the transverse and sigmoid sinuses.
- **B.** of the jugular bulb.
- **C.** of the AICA.
- **D.** all of the above
- **E.** none of the above

407. In the spinal cord, lamina 3 and 4 are also known as
- **A.** the substantia gelatinosa.
- **B.** the nucleus proprius.
- **C.** the zona intermedia.
- **D.** all of the above
- **E.** none of the above

408. The cerebellar glomerulus includes all of the following EXCEPT:
- **A.** mossy fiber terminal
- **B.** Golgi cell dendrite
- **C.** granule cell dendrite
- **D.** Purkinje cell
- **E.** Golgi cell axon terminal

409. The most common histologic feature detected as a late sign of radiation injury is
- **A.** cellular apoptosis.
- **B.** endothelial cell proliferation.
- **C.** demyelination of the nerve fibers.
- **D.** diffuse vasculitis.
- **E.** focal white matter necrosis.

410. Which spinal cord level has the most gray matter and the least white matter?
- **A.** cervical
- **B.** thoracic
- **C.** lumbar
- **D.** sacral
- **E.** none of the above

411. This disorder, resulting from a mutation of a signaling molecule (Notch3 on chromosome 19), leads to subcortical white matter ischemic damage.
- **A.** MERRF
- **B.** CADASIL
- **C.** MPS IV
- **D.** HHT
- **E.** VHL

412. The most common side effect of high-dose dexamethasone is
- **A.** hyperglycemia.
- **B.** psychosis.
- **C.** exacerbation of peptic ulcer.
- **D.** aseptic necrosis.
- **E.** skin rash.

413. All of the following regarding cryptococcal meningitis is true EXCEPT:
- **A.** Patients rarely complain of headache.
- **B.** Nausea, vomiting, mental status changes, and cranial nerve palsies are features.
- **C.** It is caused by an encapsulated budding yeast.
- **D.** In some communities, it is more common than toxoplasmosis as a cause of presenting neurologic illness associated with HIV infection.
- **E.** Infection occurs by the inhalation of organisms resulting in a primary pulmonary focus of infection.

414. What percentage of cerebrospinal fluid leaks from basilar skull fractures will resolve spontaneously?
- **A.** 5%
- **B.** 25%
- **C.** 45%
- **D.** 65%
- **E.** 85%

415. Co-secretion of the glycoprotein α-subunit in measurable excess occurs in pituitary tumors that secrete
- **A.** PRL.
- **B.** ACTH.
- **C.** TSH.
- **D.** all of the above
- **E.** none of the above

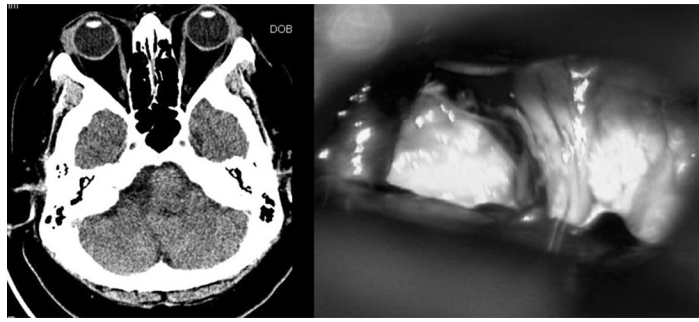
416. During the caloric test, the superior vestibular nerve constitutes the main afferent
- **A.** from the superior semicircular canal.
- **B.** from the lateral semicircular canal.
- **C.** from the posterior semicircular canal.
- **D.** all of the above
- **E.** none of the above

417. The inferior orbital fissure is mainly formed
- **A.** by the sphenoid bone only.
- **B.** by the sphenoid and ethmoid bones.
- **C.** by the zygomatic and palatine bones.
- **D.** by the sphenoid and maxilla.
- **E.** none of the above

418. Many spinocerebellar fibers are distributed
- **A.** to the medial vermal region of the anterior lobe.
- **B.** to the lateral region of anterior lobe.
- **C.** to the medial vermal region of posterior lobe.
- **D.** to the lateral region of posterior lobe.
- **E.** none of the above

419. Which of the following is NOT an indication for stereotactic radiosurgery?
- **A.** cerebral arteriovenous malformation
- **B.** metastatic tumor from non–small-cell lung carcinoma
- **C.** 1.0 cm acoustic schwannoma limited to the IAC
- **D.** 1.5 cm petrous apex meningioma not distorting the brainstem
- **E.** 1.0 cm aneurysm at the top of basilar artery

420. All of the following are true about the tumor represented below by CT and intraoperative imaging EXCEPT:



A. Initial symptoms present between the ages of 20 and 40 years.
B. It may cause longstanding ventriculitis.
C. It is associated with midline fusion defect.
D. It demonstrates linear growth.
E. The surgeon must avoid spillage of tumor contents in the subarachnoid space.

421. All of the following disorders are autosomal recessive EXCEPT:
A. maple syrup urine disease
B. adrenoleukodystrophy
C. Wilson's disease
D. Refsum's disease
E. homocystinuria

422. In cerebral salt wasting syndrome, patients are usually
A. hypervolemic and hypernatremic.
B. hypervolemic and hyponatremic.
C. hypovolemic and hypernatremic.
D. hypovolemic and hyponatremic.
E. none of the above

423. All of the following are true of toxoplasmosis EXCEPT:
A. It is the most common cause of intracerebral mass associated with HIV infection when CD4 counts fall below 100/mm^3.
B. Chorea in a patient with AIDS may be pathognomonic of toxoplasmosis.
C. Radiographic images show an asymmetric target sign.
D. The presenting neurologic symptom is nonfocal and superimposed on a global encephalopathy.
E. Therapy includes pyrimethamine and sulfadiazine.

424. The fracture that initiates a leptomeningeal cyst most commonly involves
- **A.** the frontal bone.
- **B.** the sphenoid bone.
- **C.** the temporal bone.
- **D.** the parietal bone.
- **E.** the occipital bone.

425. Which of the following medical therapies for pituitary tumors is known for its side effect of gallstone formation?
- **A.** bromocriptine
- **B.** GnRH agonists
- **C.** octreotide
- **D.** all of the above
- **E.** none of the above

426. Which of the following are reasonable criteria for recommending patients for stereotactic surgery for acoustic neuroma?
- **A.** The patient is elderly with a medium-sized tumor.
- **B.** The patient has recently been hospitalized and is on two heart medications and a water pill.
- **C.** The tumor is on the side of the patient's only hearing ear.
- **D.** all of the above
- **E.** none of the above

427. Bill's bar is a bony protuberance that separates
- **A.** the facial and superior vestibular nerves.
- **B.** the facial and inferior vestibular nerves.
- **C.** the acoustic and superior vestibular nerves.
- **D.** the acoustic and inferior vestibular nerves.
- **E.** none of the above

428. Which of the following persistent circulations is the most common?
- **A.** trigeminal artery
- **B.** otic artery
- **C.** hypoglossal artery
- **D.** proatlantal intersegmental artery
- **E.** fetal posterior communicating artery

429. A 42-year-old professional musician presents in the neurosurgery clinic with a complaint of "a blocked feeling in my ear." An axial, gadolinium-enhanced, T1-weighted MRI at the internal acoustic canal level is shown in the figure. Management strategies may include all EXCEPT:

A. audiogram with pure tones and speech reception
B. counseling regarding the options of surgery or radiosurgery.
C. workup for a planned craniotomy
D. consent for angiography and possible embolization
E. observation

430. An upper homonymous quadrantanopsia is most likely to arise from a lesion
A. to the ipsilateral parietal lobe.
B. to the contralateral parietal lobe.
C. to the ipsilateral temporal lobe.
D. to the contralateral temporal lobe.
E. to the occipital cortex.

431. The following neurogenetic diseases display trinucleotide repeat EXCEPT:
A. fragile X syndrome
B. myotonic dystrophy
C. olivopontocerebellar atrophy
D. Huntington's disease
E. Machado-Joseph disease

432. A patient approaching local anesthetic overdose will typically complain
A. of chest tightening.
B. of lightheadedness.
C. of tingling around the mouth.
D. of shortness of breath.
E. of nothing.

433. Regarding motor skill learning, which of the following is most accurate of a motor act performed repeatedly and mastered?
- **A.** There is progressive attenuation of the cerebellar and premotor areas, but no change of activity in the primary motor cortex.
- **B.** There is progressive attenuation of the cerebellar, but no change in the premotor and primary motor cortices.
- **C.** There is no change in the cerebellar, but progressive attenuation of the premotor and primary motor cortices.
- **D.** There is no change in the cerebellar and premotor cortices, but progressive attenuation of the primary motor cortex.
- **E.** There is no change in activity of the cerebellar, premotor, or primary motor cortex.

434. All of the following are true of extradural hematomas EXCEPT:
- **A.** They can appear crescentic.
- **B.** The lucid interval is seen in ~80% of patients.
- **C.** A dry eye postoperatively is from traction injury of a nerve.
- **D.** Outcome correlates well with the clinical state prior to surgery.
- **E.** Poor outcome is correlated with delay in surgery.

435. Major indications for craniotomy for pituitary tumors is/are
- **A.** tumor extension into the middle fossae.
- **B.** a dumbbell-shaped tumor with constriction in the middle.
- **C.** a tumor claimed to be fibrous on previous transphenoidal resection.
- **D.** all of the above
- **E.** none of the above

436. An Auditory Brainstem Implant (ABI) is most useful during tumor removal when placed
- **A.** in the third ventricle.
- **B.** in the jugular vein.
- **C.** in the lateral recess of the fourth ventricle.
- **D.** in the lumbar cistern.
- **E.** none of the above

437. The nerve that innervates the rhomboids and levator scapula arises from which segment of the brachial plexus?
- **A.** root
- **B.** trunk
- **C.** division
- **D.** cord
- **E.** branch

438. Which of the following conditions is associated with neurofibrillary tangles?
- **A.** Alzheimer's disease
- **B.** Down syndrome
- **C.** progressive supranuclear palsy
- **D.** SSPE
- **E.** all of the above

439. A patient has a subarachnoid hemorrhage from the aneurysm shown here. During surgery via right craniotomy, what part of normal brain may be removed to gain better visualization of the aneurysm?

- **A.** temporal tip
- **B.** the area lateral to cranial nerve I
- **C.** right-sided inferior frontal gyrus
- **D.** all of the above
- **E.** none of the above

440. The ophthalmic artery pierces the dura to enter the orbit near
- **A.** the anterior clinoid process.
- **B.** the oculomotor nerve.
- **C.** the optic strut.
- **D.** the trochlear nerve.
- **E.** the vomer.

441. The cuneus lies between which sulci?
- **A.** sulcus cinguli and parieto-occipital sulcus
- **B.** calcarine and cingulate
- **C.** sylvian and calcarine
- **D.** parieto-occipital and calcarine
- **E.** none of the above

442. Regarding cerebral aneurysms, which of the following statements is FALSE?
- **A.** Oxyhemoglobin and bilirubin are the agents likely producing the meningeal response.
- **B.** The size of an intracerebral hematoma is directly related to the chance of the patient developing vasospasm.
- **C.** Only ~1% of cerebral aneurysms results in subdural bleeding.
- **D.** It has a single layer of endothelium.
- **E.** The most important factor in assessing bleeding risk is the temporal relationship to the previous bleed.

443. Volatile anesthetics
- **A.** reduce cerebral metabolic rate (CMR) and increase cerebral blood flow (CBF).
- **B.** reduce CMR and CBF.
- **C.** increase CMR and CBF.
- **D.** increase CMR and reduce CBF.
- **E.** have no effect on CMR and increase CBF.

444. Prolonged ulnar and median F response latencies could represent a conduction block
- **A.** in the upper trunk.
- **B.** in the upper and middle trunk.
- **C.** in the middle trunk.
- **D.** in the middle and lower trunk.
- **E.** in the lower trunk.

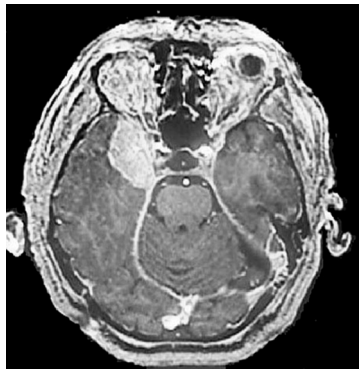
445. An abnormal skin histamine response is a characteristic feature
- **A.** of Horner's syndrome.
- **B.** of Frey's syndrome.
- **C.** of Chagas' disease.
- **D.** of Familial dysautonomia.
- **E.** none of the above

446. Which foramen of the cranial base is situated at the junction of the occipital and temporal bone?
- **A.** foramen ovale
- **B.** foramen magnum
- **C.** jugular foramen
- **D.** all of the above
- **E.** none of the above

447. Which tract is a projection from the habenula?
- **A.** diagonal band of Broca
- **B.** fasciculus retroflexus
- **C.** ansa lenticularis
- **D.** lenticular fasciculus
- **E.** none of the above

448. Which of the following is/are true of microaneurysms?
- **A.** They form as part of normal aging but are not affected by hypertension.
- **B.** They form as part of normal aging and are accentuated by hypertension.
- **C.** They are not part of the normal aging process and are not affected by hypertension.
- **D.** They are not part of normal aging and are accentuated by hypertension.
- **E.** none of the above

449. A contrast enhanced, axial, T1-weighted MRI scan of a 56-year-old male is shown here. The most likely symptoms he might have are



- **A.** dizziness, ataxia, balance problems.
- **B.** expressive aphasia with positive Romberg's sign.
- **C.** tinnitus and reduced hearing in right ear with frequent falling.
- **D.** ptosis of the right eye with weakness of external ocular muscles.
- **E.** weakness in the right side of body especially in the upper limbs.

450. Which artery is most closely associated with cranial nerves VII and VIII?
- **A.** superior cerebellar artery
- **B.** basilar artery
- **C.** AICA
- **D.** PICA
- **E.** vertebral artery

451. The medulla includes all of the following structures EXCEPT:
- **A.** olive
- **B.** tuberculum cinereum
- **C.** vagal trigone
- **D.** facial colliculus
- **E.** origin of the glossopharyngeal nerve

452. Regarding vascular malformations, which of the following statements is FALSE?
- **A.** Arteriovenous malformations can contain neural parenchyma.
- **B.** Calcification is common in cavernous malformations.
- **C.** Hemosiderin-laden macrophages are common in venous malformations.
- **D.** Capillary malformations do not show progressive growth.
- **E.** Early angiographic filling is seen with AVMs.

453. In a patient with subarachnoid hemorrhage, calcium channel blocking agents can be expected to have a
- **A.** beneficial effect, improve angiographic vasospasm, and increase CBF.
- **B.** beneficial effect, improve angiographic vasospasm.
- **C.** beneficial effect.
- **D.** detrimental effect.
- **E.** detrimental effect and decrease CBF.

454. The anatomy of PICA is such that important branches to the deep cerebellar nuclei leave the vessel at the top of the cranial loop. The name of this point and the segment of PICA it arises from are
- **A.** the plexal point, tonsillomedullary segment.
- **B.** the choroidal point, tonsillomedullary segment.
- **C.** the plexal point, telovelotonsillar segment.
- **D.** the choroidal point, telovelotonsillar segment.
- **E.** none of the above

455. The principal neuroanatomical substrate of perceptual organization is
- **A.** the anterior right hemisphere.
- **B.** the posterior right hemisphere.
- **C.** the anterior left hemisphere.
- **D.** the posterior left hemisphere.
- **E.** none of the above

456. The sigmoid sinus and the superior petrosal sinuses are boundaries
- **A.** of Trautmann's triangle.
- **B.** of Parkinson's triangle.
- **C.** of Wernicke's triangle.
- **D.** of Labbé's triangle.
- **E.** of Calot's triangle.

457. The lateral lemnisci are connected
- **A.** by the trapezoid body.
- **B.** by the commissure of Probst.
- **C.** by the juxtarestiform body.
- **D.** all of the above
- **E.** none of the above

458. A solid, contrast-enhancing mass of the third ventricle that stains intensely for glial fibrillary acidic protein (GFAP) is most likely a
- **A.** choroid plexus tumor.
- **B.** colloid cyst.
- **C.** central neurocytoma.
- **D.** choroid glioma.
- **E.** glioblastoma multiforme.

459. One of the contradictions of stereotactic radiosurgery in the management of metastatic tumors is
- **A.** three tumors, each measuring 1 to 1.5 cm within the right hemisphere.
- **B.** solitary left parietal tumor measuring 2 cm ˘ 2 cm ˘ 1.8 cm.
- **C.** a 2.5-cm left mesial temporal tumor with clinical signs of impending herniation.
- **D.** tumors both in the supratentorial and infratentorial compartments.
- **E.** None of the above are contraindications.

460. The sphenoparietal sinus can be found
- **A.** at the outer aspect of the lesser wing of the sphenoid.
- **B.** at the inner aspect of the lesser wing of the sphenoid.
- **C.** at the outer aspect of the greater wing of the sphenoid.
- **D.** at the inner aspect of the greater wing of the sphenoid.
- **E.** at the cavernous sinus.

461. The precuneus (area 7) can be found
- **A.** on the lateral aspect of the frontal lobe.
- **B.** on the medial aspect of the frontal lobe.
- **C.** on the lateral aspect of the occipital lobe.
- **D.** on the medial aspect of the occipital lobe.
- **E.** on the medial aspect of the parietal lobe.

462. The most common vascular malformation is
- **A.** capillary telangiectasia.
- **B.** venous malformation.
- **C.** arteriovenous malformation.
- **D.** cavernous malformation.
- **E.** dural arteriovenous fistula.

463. The anterior meningeal artery typically arises
- **A.** from the ophthalmic artery.
- **B.** from the maxillary artery.
- **C.** from the middle meningeal artery.
- **D.** from the occipital artery.
- **E.** from the facial artery.

464. The caudal anterior limb of the internal capsule is supplied
- **A.** by the middle cerebral artery.
- **B.** by the internal cerebral artery.
- **C.** by the recurrent artery of Heubner.
- **D.** by the posterior communicating artery.
- **E.** none of the above

465. The external urethral sphincter is composed mainly of _____fibers arranged in a _____ fashion.
- **A.** type I, longitudinal
- **B.** type II, longitudinal
- **C.** type I, circular
- **D.** type II, circular
- **E.** none of the above

466. Regarding atlanto-occipital dislocation all of the following are true EXCEPT:
- **A.** It should be suspected in a multitrauma victim with mandibular fractures and submental lacerations.
- **B.** Prevertebral soft tissue swelling may be the only clue to its diagnosis.
- **C.** The gap between the occipital condyles and condylar surface of the atlas is greater than 5 mm.
- **D.** The distance between the tip of the dens and basion is less than 12 mm.
- **E.** The clivus line is not tangential to the odontoid.

467. The action potential in the neuron is initiated
- **A.** at the dendrite.
- **B.** at the soma.
- **C.** at the hillock.
- **D.** at the node of Ranvier.
- **E.** at the axon terminal.

468. Which of the following conditions is most often associated with chronic temporal lobe epilepsy?
- **A.** pilocytic astrocytoma
- **B.** ganglioglioma
- **C.** DNET
- **D.** astrocytoma
- **E.** pleomorphic xanthoastrocytoma

469. Which of the following is NOT a functional indication for stereotactic radiosurgery?
- **A.** trigeminal neuralgia refractory to medication
- **B.** glossopharyngeal neuralgia in a patient with carbamazepine hypersensitivity.
- **C.** unilateral essential tremors refractory to medication
- **D.** Parkinson's tremor in the left upper extremity with levodopa-induced dyskinesias
- **E.** Huntington's chorea

470. Regarding the venous drainage of the insula, which of the following statements is true?
- **A.** The entire insula drains to the deep venous system.
- **B.** The entire insula drains to the superficial venous system.
- **C.** The anterior portion of the insula drains to the deep system.
- **D.** The posterior portion of the insula drains to the superficial system.
- **E.** none of the above

471. Which of the following separates the anterior cerebellar lobe from the posterior cerebellar lobe?
- **A.** posterolateral fissure
- **B.** horizontal fissure
- **C.** dorsolateral fissure
- **D.** primary fissure
- **E.** postlunate fissure

472. Regarding spinal vascular malformations, which of the following is FALSE?
- **A.** Dural arteriovenous fistulas are believed to be acquired.
- **B.** Normal neural parenchyma is seen within juvenile AVMs.
- **C.** Glomus AVMs may have associated aneurysms.
- **D.** Acute progression is most likely due to venous congestion.
- **E.** Dural AV fistulas have a female predilection.

473. The ischemic penumbra has a cerebral blood flow
- **A.** of 1 to 8 mL/100 g/min.
- **B.** of 8 to 23 mL/100 g/min.
- **C.** of 23 to 30 mL/100 g/min.
- **D.** of 30 to 40 mL/100 g/min.
- **E.** of 40 to 50 mL/100 g/min.

474. What is the area interposed between the lenticular fasciculus and the thalamic fasciculus?
- **A.** substantia nigra
- **B.** pedunculopontine nucleus
- **C.** zona incerta
- **D.** subthalamic nucleus
- **E.** none of the above

475. Which of the following areas modulate control of micturition?
- **A.** medial parts of the frontal lobes
- **B.** preoptic region of the hypothalamus
- **C.** basal ganglia
- **D.** all of the above
- **E.** none of the above

476. The juxtarestiform body is _____ to the _____cerebellar peduncle.
- **A.** lateral, inferior
- **B.** lateral, superior
- **C.** medial, inferior
- **D.** medial, superior
- **E.** none of the above

477. The flower spray ending is associated with which nerve type?
- **A.** IA
- **B.** IB
- **C.** II
- **D.** III
- **E.** IV

478. When performing a caudalis rhizotomy, which tract is penetrated to access the target?
- **A.** ventral spinocerebellar tract
- **B.** dorsal spinocerebellar tract
- **C.** gracile fasciculus
- **D.** cuneate fasciculus
- **E.** none of the above

479. The arterial dicrotic notch
- **A.** has no corresponding area in the intracranial pressure (ICP) waveform.
- **B.** corresponds to the area between P1 and P2 of the ICP waveform.
- **C.** corresponds to the area between P2 and P3 of the ICP waveform.
- **D.** corresponds to the area after P3 of the ICP waveform.
- **E.** none of the above

480. The basal vein of Rosenthal begins at this area on the base of the brain.
- **A.** anterior perforated substance
- **B.** posterior perforated substance
- **C.** tuber cinereum
- **D.** medial geniculate body
- **E.** lateral geniculate body

481. The calcified glomus of the choroid plexus seen on CT is most often found
- **A.** in the frontal horn.
- **B.** in the third ventricle.
- **C.** in the trigone.
- **D.** in the occipital horn.
- **E.** in the foramen of Monro.

482. Decussation of the superior cerebellar peduncles occurs in which area of the brain?
- **A.** cerebellum
- **B.** rostral midbrain
- **C.** rostral pons
- **D.** caudal midbrain
- **E.** caudal pons

483. Cranial nerves IX, X, and XI are supplied
- **A.** by the superior thyroid artery.
- **B.** by the ascending pharyngeal artery.
- **C.** by the lingual artery.
- **D.** by the facial artery.
- **E.** by the occipital artery.

484. Attempted lateral gaze where there is destruction of the abducens nucleus results
- **A.** in ipsilateral lateral and medial rectus palsies.
- **B.** in ipsilateral lateral and contralateral medial rectus palsies.
- **C.** in contralateral lateral and ipsilateral medial rectus palsies.
- **D.** in contralateral lateral and medial rectus palsies.
- **E.** none of the above

485. Brainstem auditory evoked response (BAER) is most useful to monitor the function
- **A.** of the medial lemniscus.
- **B.** of the lateral lemniscus.
- **C.** of the corticospinal tracts.
- **D.** all of the above
- **E.** none of the above

486. The lateral subnucleus of cranial nerve III innervates
- **A.** the inferior rectus.
- **B.** the inferior oblique.
- **C.** the medial rectus.
- **D.** all of the above
- **E.** none of the above

487. Deep pressure and joint position is localized to Brodmann's area
- **A.** 3a.
- **B.** 3b.
- **C.** 2.
- **D.** 1.
- **E.** none of the above

488. Which of the following is the least consistent feature of conus syndrome?
- **A.** symmetric involvement
- **B.** pain
- **C.** saddle anesthesia
- **D.** bladder and bowel symptoms
- **E.** sudden onset

489. Malignant peripheral nerve sheath tumors most commonly affect cranial nerve
- **A.** III.
- **B.** IV.
- **C.** V.
- **D.** VI.
- **E.** VII.

490. The superior ophthalmic vein courses most closely with which cranial nerves?
- **A.** IV (trochlear) and V (trigeminal)
- **B.** III (oculomotor) and IV
- **C.** III and II (optic)
- **D.** V and VI (abducens)
- **E.** II and IV

491. The caudate nucleus forms
- **A.** the medial wall of the frontal horn.
- **B.** the floor of the temporal horn.
- **C.** the lateral wall of the occipital horn.
- **D.** the roof of the lateral ventricle.
- **E.** none of the above

492. Which of the following is true regarding the dorsal trigeminothalamic tract?
- **A.** It arises from the principal sensory nucleus of V.
- **B.** It terminates on the VPM thalamus.
- **C.** It conveys touch and pressure information from the face.
- **D.** It is an uncrossed tract.
- **E.** All of the above

493. Valveless emissary veins are found in which layer of the scalp?
- **A.** skin
- **B.** subcutaneous tissue
- **C.** galea
- **D.** loose areolar tissue
- **E.** periosteum

494. Apocrine sweat glands in the axilla are innervated by what type of fibers?
- **A.** adrenergic fibers
- **B.** cholinergic fibers
- **C.** nitric oxide
- **D.** VIP
- **E.** none of the above

495. The greatest decline in water content of the nucleus pulposus occurs
- **A.** just after birth.
- **B.** in childhood.
- **C.** in adolescence.
- **D.** in young adulthood.
- **E.** in late adulthood.

496. The tapeta are fibers
- **A.** from the claustrum.
- **B.** from the globus pallidus.
- **C.** from the corpus callosum.
- **D.** from the thalamus.
- **E.** none of the above

497. Dressing apraxia is most often described with lesions
- **A.** of the dominant frontal lobe.
- **B.** of the nondominant frontal lobe.
- **C.** of the dominant parietal lobe.
- **D.** of the nondominant parietal lobe.
- **E.** none of the above

498. Cerebrospinal fluid is reabsorbed into the bloodstream
- **A.** through the valveless arachnoid villi.
- **B.** through the pressure insensitive valves of the arachnoid villi.
- **C.** through the pressure sensitive one-way valves of the arachnoid villi.
- **D.** through the pressure insensitive valveless arachnoid villi.
- **E.** none of the above

499. The precursor of ACTH is
- **A.** CLIP.
- **B.** Beta-lipotropin.
- **C.** Alpha-MSH.
- **D.** POMC.
- **E.** none of the above

500. Regarding myasthenia gravis (MG), which of the following statements is FALSE?
- **A.** It involves autoantibodies directed against acetylcholine receptors at the neuromuscular junction.
- **B.** The prevalence is between 1 in 10,000 and in 15,000.
- **C.** Juvenile MG is more common in Asians.
- **D.** There is an increased incidence of an underlying thymoma in late-onset MG.
- **E.** Late-onset MG is more common in females.

501. The internal carotid artery (ICA) enters the cranium via a canal formed
- **A.** by the sphenoid bone.
- **B.** by the occipital bone.
- **C.** by the sphenoid and temporal bones.
- **D.** by the temporal bone.
- **E.** by the temporal and occipital bones.

502. All of the following are true of the trochlear nerve EXCEPT:
- **A.** It has a nucleus located in the midbrain tegmentum at the level of the inferior colliculus.
- **B.** It decussates in the superior medullary velum.
- **C.** It exits the brainstem from the dorsal surface.
- **D.** It courses lateral to the frenulum of the superior medullary velum.
- **E.** Damage to the nucleus results in dysfunction of the superior oblique muscle on that side.

503. The asterion is located at the intersection
- **A.** of the lambdoid, occipitomastoid, and parietomastoid sutures.
- **B.** of the lamboid, sagittal, and occipitomastoid sutures.
- **C.** of the lambdoid, sagittal and parietomastoid sutures.
- **D.** of the sagittal and occipitomastoid sutures.
- **E.** none of the above

504. Which nucleus of the hypothalamus is involved with the dissipation of heat?
- **A.** posterior nucleus
- **B.** ventromedial nucleus
- **C.** lateral nucleus
- **D.** anterior nucleus
- **E.** none of the above

505. Which of the following joints lack an intervertebral disc?
- **A.** occipitoatlantal joint
- **B.** atlantoaxial joint
- **C.** sacrum
- **D.** all of the above
- **E.** none of the above

506. The diagnosis of syndrome of inappropriate secretion of antidiuretic hormone (SIADH) is made by the following observations EXCEPT:
- **A.** serum sodium <135 mEq/L
- **B.** serum osmolarity <280 mOsm/L
- **C.** hypervolemia
- **D.** urine sodium >20 mmol/24 h
- **E.** urine osmolarity > serum osmolarity

507. Which of the following congenital conditions results in a deficit in abduction of the eye resulting from failure of development of motoneurons in the sixth nerve nucleus?
- **A.** Marcus Gunn syndrome
- **B.** Joubert's syndrome
- **C.** De Morsier's syndrome
- **D.** Duane's syndrome
- **E.** none of the above

508. Dilantin levels are increased by all of the following EXCEPT:
- **A.** cimetidine
- **B.** coumadin
- **C.** carbamazepine
- **D.** isoniazid
- **E.** sulfa drugs

509. Which of the following fiber tracts end as climbing fibers?
- **A.** olivocerebellar
- **B.** reticulocerebellar
- **C.** pontocerebellar
- **D.** all of the above
- **E.** none of the above

510. The most relevant factor in assessing prognosis of paraganglioma patients is
- **A.** tumor location.
- **B.** tumor size.
- **C.** time to surgery.
- **D.** response to chemotherapy and radiation.
- **E.** none of the above

511. The anteromedial middle fossa triangle is defined by cranial nerves
- **A.** IV and V_1.
- **B.** V_1 and V_2.
- **C.** V_2 and V_3.
- **D.** V_3 and VI.
- **E.** none of the above

512. Hyperperfusion encephalopathy most commonly involves which part of the brain?
- **A.** subcortical white matter of the occipital lobes bilaterally with little to no edema
- **B.** subcortical white matter of the occipital lobes bilaterally with edema
- **C.** the cortical ribbon of the parietal lobes bilaterally
- **D.** the cortical ribbon and subcortical white matter bilaterally
- **E.** the cortical ribbon with sparing of the subcortical U-fibers

513. Glasscock's triangle is defined by the posterior border of V_3 and which foramina?
- **A.** foramen ovale and spinosum
- **B.** foramen ovale and rotundum
- **C.** foramen rotundum and spinosum
- **D.** foramen spinosum and lacerum
- **E.** foramen lacerum and ovale

514. Which of the following is FALSE regarding hyperperfusion encephalopathy?
- **A.** The vast majority of patients recover completely.
- **B.** The edema tends to resorb completely.
- **C.** The vertebrobasilar system is vulnerable due to extensive sympathetic innervation.
- **D.** A similar condition may occur after a carotid endarterectomy.
- **E.** Patients with hyperperfusion encephalopathies often have labile blood pressures.

515. All of the following are correct statements about the central sulcus EXCEPT:
- **A.** It separates the frontal lobe from the parietal lobe.
- **B.** It separates the motor cortex from the sensory cortex.
- **C.** It extends into the paracentral lobule.
- **D.** It is usually continuous with the lateral sulcus.
- **E.** It is located on the lateral convex surface of the hemisphere.

516. Which of the following is NOT a feature of migraine headaches?
- **A.** normal intraocular pressure
- **B.** ipsilateral flushing
- **C.** decreased local skin temperature
- **D.** female predominance
- **E.** no aura is seen with common migraines.

517. Cortical paralysis of visual fixation, optic ataxia, and disturbance of visual attention, with preservation of spontaneous and reflex eye movements may be seen after bilateral parietooccipital lesions. The syndrome described is
- **A.** Anton's syndrome.
- **B.** Adie's syndrome.
- **C.** Cogan's syndrome.
- **D.** Vernet's syndrome.
- **E.** Balint's syndrome.

518. During a selective amygdalohippocampectomy for intractable seizures, the surgeon must be aware that the most medial part of the amygdala is in close proximity
- **A.** to the basal ganglia.
- **B.** to the anterior commissure.
- **C.** to the caudate nucleus.
- **D.** all of the above
- **E.** none of the above

519. The anterior choroidal artery usually runs _____ to the posterior communicating artery, and _____ to the optic tract.
- **A.** lateral, parallel
- **B.** medial, parallel
- **C.** lateral, perpendicular
- **D.** medial, perpendicular
- **E.** none of the above

520. Which of the following muscles is a medial rotator of the thigh?
- **A.** piriformis
- **B.** obturator internus
- **C.** quadratus femoris
- **D.** gluteus minimus
- **E.** gluteus maximus

521. Lewy bodies may be seen in all the following EXCEPT:
- **A.** Parkinson's disease
- **B.** Shy-Drager syndrome
- **C.** multiple system atrophy (MSA)
- **D.** diffuse Lewy body dementia
- **E.** paralysis agitans

522. The largest contributor to the internal cerebral vein is
- **A.** the septal vein.
- **B.** the thalamostriate vein.
- **C.** the caudate vein.
- **D.** the basal vein of Rosenthal.
- **E.** the vein of Galen.

523. During a thalamotomy for parkinsonian tremor, the patient reports that he has paresthesias of the fingertips and the mouth. This would most likely be due to the electrode being too
A. anterior to the target.
B. posterior to the target.
C. medial to the target.
D. lateral to the target.
E. close to the target.

524. Deficiencies of complement components C5 and C6-C9 predispose
A. to *Streptococcus pneumoniae.*
B. to *Haemophilus influenzae.*
C. to *Neisseria meningitidis.*
D. to *Proteus.*
E. none of the above

525. Meningiomas of the ventricular system are most frequently located
A. at the body.
B. at the trigone.
C. at the temporal horn.
D. at the occipital horn.
E. at the frontal horn.

526. In patients with multiple cerebral metastases, the most important determinant of survival is
A. the size of the largest metastasis.
B. the extent of systemic disease.
C. the number of visible metastases on MRI.
D. the neurologic condition preoperatively.
E. the proximity to eloquent cortex.

527. Sensory axons that transmit information from the Golgi tendon organs are
A. Ia (A-α).
B. Ib (A-α).
C. II (A-β).
D. III (A-δ).
E. IV (C).

528. The vast majority of spinal epidural abscesses can be best described as
A. caused by staphylococci, and occur in the cervical cord.
B. caused by streptococci, and occur in the cervical cord.
C. caused by staphylococci, and occur in the thoracic cord.
D. caused by streptococci, and occur in the thoracic cord.
E. caused by staphylococci, and occur in the lumbar cord.

529. With regard to shunt infections, which of the following is FALSE?
- **A.** *Staphylococcus* is the organism implicated in a majority of cases.
- **B.** Symptoms include shunt failure, headache, nausea, and vomiting.
- **C.** Elevated temperature is a more reliable sign of infection in VA as opposed to VP shunts.
- **D.** There is a greater risk of shunt infection with distal revision than proximal revision.
- **E.** *Staphylococcus* infections may cause obstruction without fever.

530. Which of the following is the most common type of tumor arising in the sella following irradiation for pituitary adenoma?
- **A.** liposarcoma
- **B.** fibrosarcoma
- **C.** angiosarcoma
- **D.** chondrosarcoma
- **E.** osteosarcoma

531. Dopamine loss in Parkinson's disease is believed to lead
- **A.** to disinhibition of the subthalamic nucleus.
- **B.** to high activity of Gpi/SNr.
- **C.** to inhibition of the motor thalamus.
- **D.** all of the above
- **E.** none of the above

532. Which of the following is true regarding the etiology of postoperative diabetes insipidus?
- **A.** It is due to disruption of the pituitary stalk.
- **B.** There is degeneration of distal axons in the region of dissection.
- **C.** Stored ADH is depleted.
- **D.** All of the above
- **E.** None of the above

533. Which of the following parasites present with cord compression in infected patients?
- **A.** strongyloides
- **B.** schistosomiasis
- **C.** paragonimiasis
- **D.** neurocysticercosis
- **E.** echinococcus

534. The mediodorsal nucleus of the thalamus is reciprocally connected
- **A.** to the cingulated gyrus.
- **B.** to the prefrontal cortex.
- **C.** to the substantia nigra.
- **D.** to the lateral lemniscus.
- **E.** to the inferior parietal lobule.

535. Lymphoma metastatic to the brain tends to localize
- **A.** to the subependymal.
- **B.** to the gray-white junction.
- **C.** to the meninges.
- **D.** to the frontal lobe.
- **E.** to the corpus callosum.

536. In developing an interforniceal plane for resection of an anterior third ventricular tumor, the surgeon must be most cognizant of what structure in the posterior component of the forniceal structure?
- **A.** anterior commissure
- **B.** posterior commissure
- **C.** hippocampal commissure
- **D.** all of the above
- **E.** none of the above

537. All the following are true of the centromedian nucleus of the thalamus EXCEPT:
- **A.** It is the largest of the intralaminar nuclei.
- **B.** It receives input from the globus pallidus.
- **C.** It projects to the striatum.
- **D.** It projects diffusely to the entire neocortex.
- **E.** It is reciprocally connected to areas 41 and 42.

538. The stylomastoid foramen is located _____ to the insertion of the _____ belly of the digastric muscle.
- **A.** medial, anterior
- **B.** medial, posterior
- **C.** lateral, anterior
- **D.** lateral, posterior
- **E.** none of the above

539. Mutism following transcallosal surgery may be the result
- **A.** of division of the anterior corpus callosum.
- **B.** of retraction on the fornix.
- **C.** of circulatory disturbance in the SMA.
- **D.** all of the above
- **E.** none of the above

540. Which of the following are sources of input to the red nucleus?
- **A.** dentate nucleus
- **B.** globose nucleus
- **C.** emboliform nucleus
- **D.** all of the above
- **E.** none of the above

541. Which of the following is a noncompetitive alpha-blocker?
- **A.** phentolamine
- **B.** atropine
- **C.** phenylephrine
- **D.** amphetamine
- **E.** phenoxybenzamine

542. All of the following are true statements regarding the cerebral metabolic rate ($CMRO_2$) EXCEPT:
- **A.** Forty percent of the energy consumed is for maintenance of ionic gradients.
- **B.** Once EEG silence is induced, barbiturates will not produce further reductions in ($CMRO_2$).
- **C.** Once EEG silence is induced, temperature reduction does produce further reductions in ($CMRO_2$).
- **D.** Normal rate is ~5.5 mL/100 g/min.
- **E.** Ketamine anesthesia decreases $CMRO_2$.

543. The globus pallidus projects to which thalamic nuclei?
- **A.** centromedian
- **B.** ventral anterior
- **C.** ventral lateral
- **D.** all of the above
- **E.** none of the above

544. The major blood supply to the tumor shown here is

- **A.** from the posterior cerebral artery.
- **B.** from the posterior choroidal artery.
- **C.** from the middle cerebral artery.
- **D.** from the anterior choroidal artery.
- **E.** none of the above

545. Preoperative testing for the tumor shown here should include which of the following?

A. α-fetoprotein
B. β-HCG
C. CBC, PT, PTT
D. all of the above
E. none of the above

546. The most medial fibers in the crus cerebri are
A. frontopontine.
B. corticobulbar.
C. corticospinal.
D. parietopontine.
E. none of the above

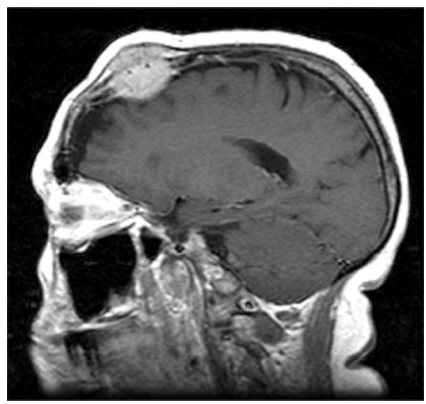
547. A 45-year-old woman is brought into the urgent care center after being involved in a motor vehicle accident while driving home with her husband. Her husband was ejected from the car from the force of the impact and did not survive. On initial exam her eyes open to pain, and she mumbles only sounds. She localizes on the right arm, withdraws on the left side and the right leg is not examined due to the possibility of a fracture. The Glasgow Coma Scale (GCS) of this case is
A. 11.
B. 10.
C. 9.
D. 8.
E. 7.

For the MRI scans in questions **548** to **550**, choose the most likely diagnosis:

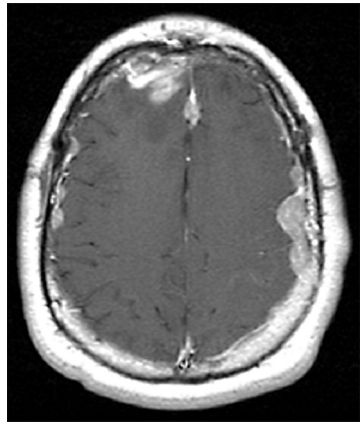
- **A.** Meningioma
- **B.** Hemangiopericytoma
- **C.** Ewing's sarcoma
- **D.** Sinonasal carcinoma metastases
- **E.** Breast carcinoma metastases

548.

549.



550.



551. Relative contraindications for surgery for spinal metastasis include all of the following EXCEPT:

- **A.** multiple myeloma
- **B.** recurrence after maximal radiation
- **C.** multiple lesions at multiple levels
- **D.** total paralysis for greater than 24 hours
- **E.** expected survival less than 4 months

552. The usual radiation dose for spinal epidural metastasis is:

- **A.** 20 Gy in 2-Gy fractions over 10 days.
- **B.** 30 Gy in 3-Gy fractions over 10 days.
- **C.** 60 Gy in 6-Gy fractions over 10 days.
- **D.** 100 Gy in 10-Gy fractions over 10 days.
- **E.** 200 Gy in 50-Gy fractions over 30 days.

For the findings in questions **553** to **556**, choose the correct toxins:

- **A.** Tetanus
- **B.** Botulism
- **C.** Diphtheria
- **D.** Reye's syndrome

553. Predilection to sensory and motor nerves of the limbs and ciliary muscle/nerve

554. Risus sardonicus

555. Initial symptom is usually difficulty in convergence of the eyes.

556. Encephalopathy typically develops 4 to 7 days after the onset of the illness.

557. Which statement is true about the presentation of multiple myeloma in the spine?
- **A.** Hypocalcemia occurs in 25% of patients.
- **B.** Bone pain is characteristic at rest and with movement.
- **C.** Occurrence of amyloidosis.
- **D.** Invasion of the spinal canal occurs in over 50% of patients.
- **E.** Definitive diagnosis can be made by plain x-ray.

558. Criteria for the diagnosis of multiple myeloma include all of the following EXCEPT:
- **A.** biopsy-proven plasmacytoma.
- **B.** myeloma cells in a single peripheral blood smear.
- **C.** plasma cells greater than 10 of 1000 cells on marrow morphology.
- **D.** radiographic survey demonstrating lytic lesions.
- **E.** monoclonal immunoglobulins in the urine or blood.

559. The Batson's plexus route of spinal metastases represents which type of spread?
- **A.** perinervous
- **B.** arterial
- **C.** venous
- **D.** direct extension
- **E.** none of the above

For the diseases in questions **560** to **564**, choose the correct chromosomal abnormality:
- **A.** 5q
- **B.** 5p
- **C.** 4
- **D.** 9
- **E.** none of the above

560. Landouzy-Dejerine

561. Werdnig-Hoffman

562. Myotonic muscular dystrophy

563. Cri-du-chat

564. Friedreich's ataxia

For the statements in questions **565** to **569**, choose the answer option that is correct.
- **A.** verapamil
- **B.** diltiazem
- **C.** digoxin
- **D.** procainamide
- **E.** esmolol

565. Preferred agent for patients with systolic heart failure

566. Side effects of hypotension and negative inotropic effect

567. Indicated for chronic rate control of atrial fibrillation

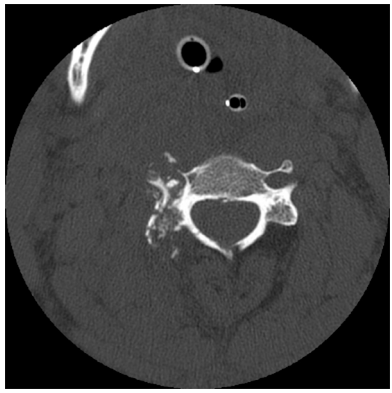
568. Contraindicated in patients with prolonged Q-T interval

569. Indicated for rate control of atrial fibrillation in the setting of a hyperadrenergic state

570. A 56-year-old woman just had a large frontal tumor resected. The tumor was positive for reticulin on immunostaining. The tumor histology contained mitotic figures as well as necrosis and pseudopalisading. The most likely diagnosis is

A. ganglioglioma.
B. gliosarcoma.
C. glioblastoma multiforme.
D. gliomatosis cerebri.
E. germinoma.

571. Which of the following is true regarding management of the injury shown here?



A. Those with mild neurologic deficits and accessible lesions are better managed by repair than ligation.
B. Proximal occlusion may be accomplished by an anterior approach with mobilization of the sternocleidomastoid.
C. Endovascular embolization with detachable balloons may be used for management.
D. All of the above are true.
E. None of the above is true.

For the syndromes in questions **572** to **577**, choose the corresponding metal.

A. Mercury
B. Manganese
C. Arsenic
D. Aluminum
E. Lead

572. Peripheral neuropathy, malaise, nausea, and vomiting

573. Encephalitis in children

574. Rigidity, bradykinesia

575. Irritability, seizures, ataxia, coma

576. Peripheral neuropathy, ataxia, renal tubular necrosis

577. Mimics the deficit of cortical cholinergic neurotransmission seen in Alzheimer's

578. Out of the following choices, which represents the most common source of arterial embolus?

A. left atrium
B. left ventricle
C. pulmonary veins
D. aorta
E. ventricular aneurysms

579. Potassium depletion would MOST likely result from which of the following diseases?

A. diabetic ketoacidosis
B. Cushing's syndrome
C. high intestinal obstruction
D. diarrhea
E. uremia

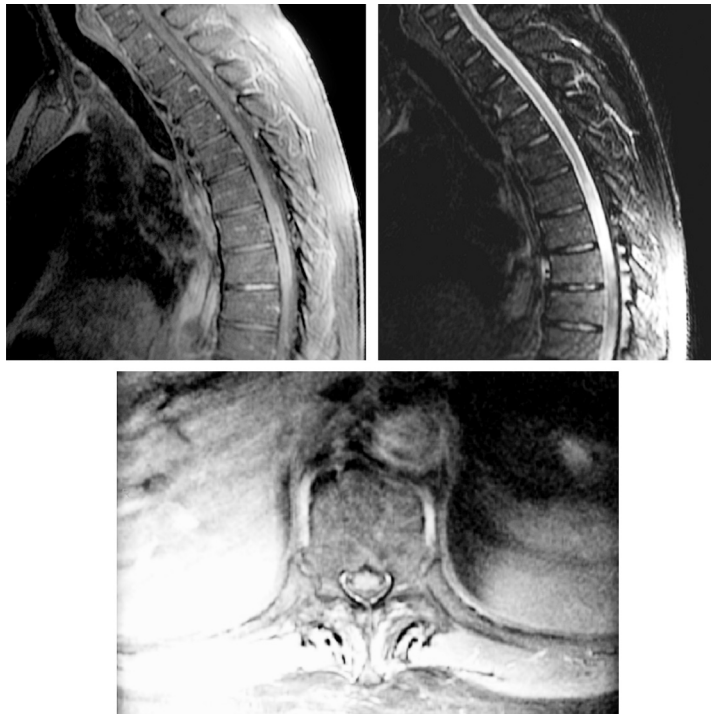
580. Which of the following is the first sign of hypomagnesemia?

A. seizures
B. tetany
C. hypotension
D. loss of deep tendon reflexes
E. stupor

581. All the following are appropriate concentrations of ions in Ringer's lactate solution EXCEPT:

A. Na^+ 130 mEq/L
B. Cl· 109 mEq/L
C. Lactate 28 mEq/L
D. Ca^{2+} 16 mEq/L
E. K^+ 4 mEq/L

582. All of the following statements are associated with the type of tumor exemplified by this MRI scan EXCEPT:



A. The male-to-female ratio is 1.5:1.
B. The thoracic location is most common.
C. It is usually low grade.
D. It is the most common intramedullary tumor in children.
E. Examination may reveal a combination of upper and lower motor neuron signs.

For the disorders in questions **583** to **585**, choose the disease option that is correct:

A. amyotrophic lateral sclerosis
B. systemic lupus erythematosus
C. metachromatic leukodystrophy
D. Lesch-Nyhan disease
E. Niemann-Pick disease

583. Arylsulfatase A deficiency

584. Superoxide dismutase mutation

585. HGPRT deficiency

For the diseases in questions **586** to **590**, choose the serum level option that is correct.

A. increased calcium, normal phosphate, and increased alkaline phosphatase
B. decreased calcium, increased phosphate, and normal alkaline phosphatase
C. decreased calcium, decreased phosphate, and increased alkaline phosphatase
D. normal calcium, normal phosphate, and increased alkaline phosphatase

586. Rickets

587. Paget's disease

588. Hyperparathyroidism

589. Primary osteoporosis

590. Hypoparathyroidism

For the gas and electrolyte data in questions **591** to **595**, choose the acid-base disorder option that is correct.

A. chronic respiratory acidosis
B. nonanion gap metabolic acidosis and respiratory alkalosis
C. metabolic alkalosis & respiratory acidosis
D. wide anion gap metabolic acidosis
E. chronic respiratory alkalosis

591. pH 7.44, pCO_2 32 mm Hg, pO_2 90 mm Hg; serum sodium 140 mEq/L; potassium 4.2 mEq/L; chloride 109 mEq/L; bicarbonate 21 mEq/L

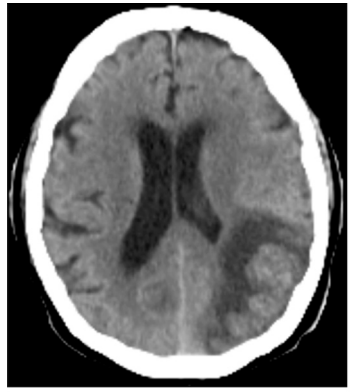
592. pH 7.40, pCO_2 19 mm Hg, pO_2 89 mm Hg; serum sodium 140 mEq/L; potassium 4.3 mEq/L; chloride 117 mEq/L; bicarbonate 11 mEq/L

593. pH 7.40, pCO_2 51 mm Hg, pO_2 87 mm Hg; serum sodium 140 mEq/L; potassium 4.5 mEq/L; chloride 97 mEq/L; bicarbonate 31 mEq/L

594. pH 7.32, pCO_2 50 mm Hg, pO_2 63 mm Hg; serum sodium 140 mEq/L; potassium 4.0 mEq/L; chloride 100 mEq/L; bicarbonate 28 mEq/L

595. pH 7.29, pCO_2 20 mm Hg, pO_2 87 mm Hg; serum sodium 137 mEq/L; potassium 4.5 mEq/L; chloride 100 mEq/L; bicarbonate 9 mEq/L

For the syndromes in questions **596** to **598**, choose the answer option that is correct.



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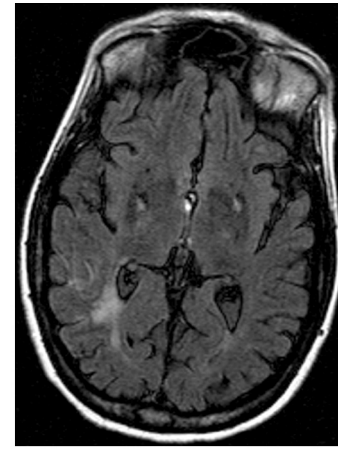


2

A. scan 1
B. scan 2
C. scans 1 and 2
D. none of the above

596. Valve prosthesis

597. Man-in-a-barrel syndrome

598. Perforating branch occlusion

599. The nucleus secreting hormones that stimulate release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) and project to the medial eminence is
- **A.** the tuberoinfundibular nucleus.
- **B.** the preoptic nucleus.
- **C.** the paraventricular nucleus.
- **D.** the mamillary bodies.
- **E.** none of the above

600. Efferent pupillary defects are seen in the following disorders EXCEPT:
- **A.** Adie's pupil
- **B.** posterior communicating artery aneurysm
- **C.** Foster Kennedy syndrome
- **D.** Horner's syndrome
- **E.** third nerve lesion

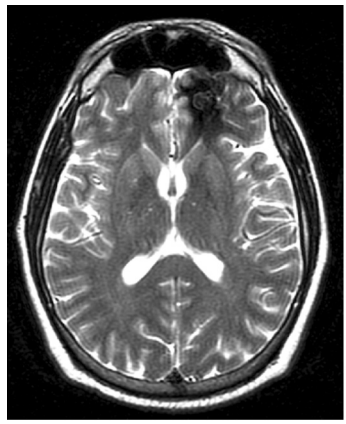
601. Relative afferent pupillary defects are seen in the following disorders EXCEPT:
- **A.** macular degeneration
- **B.** optic neuritis
- **C.** papilledema
- **D.** metabolic optic neuropathy
- **E.** retinal lesion

602. Hypoxemia due to a 50% shunt is most likely to be improved by which of the following measures?
- **A.** decreasing the positive end expiratory pressure to 0 cm H_2O
- **B.** hyperventilation
- **C.** improving mixed venous oxygen content
- **D.** oxygen supplementation
- **E.** none of the above

603. The half-life of platelets used for transfusion is
- **A.** 96 hours.
- **B.** 72 hours.
- **C.** 48 hours.
- **D.** 24 hours.
- **E.** 12 hours.

604. Which phase of blood coagulation is the most time consuming?
- **A.** conversion of prothrombin to thrombin
- **B.** activation of contact factors
- **C.** generation of thromboplastin
- **D.** release of phospholipids from platelets
- **E.** conversion of fibrinogen to fibrin

For the statements in questions **605** to **607**, choose the answer option that is correct.



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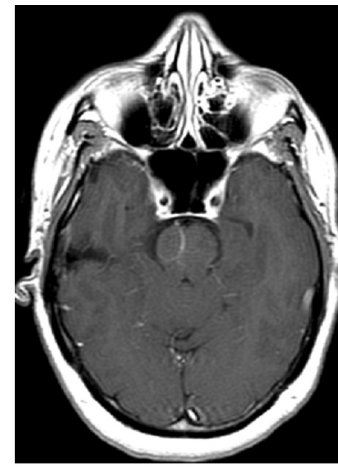


2

A. image 1
B. image 2
C. images 1 and 2
D. none of the above

605. Caused by arrested development

606. Acquired after dural thrombosis

607. Associated with blue rubber nevus syndrome

For the pathological states in questions **608** to **612**, choose the associated ocular finding option that is correct.

A. ocular bobbing
B. jerk nystagmus
C. seesaw nystagmus
D. downbeat nystagmus
E. none of the above

608. Foramen magnum compression

609. Craniopharyngioma

610. Germinoma

611. Pentobarbital infusion

612. Pontine glioma

For the descriptions in questions **613** to **616**, choose the cerebellar cell-type option that is correct.

A. granule cell
B. Golgi cell
C. Purkinje cell
D. basket cell
E. stellate cell

613. Forms the glomerulus together with the granule cell

614. Uses excitatory neurotransmitter

615. End in a rete of terminals around the cell bodies of the Purkinje cell

616. Synapse with the interposed nuclei

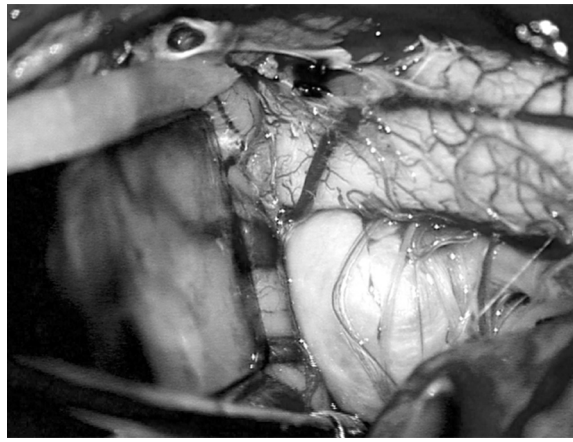
617. Which of the following is an early sign of cyanide poisoning?
A. blurred vision
B. diaphoresis
C. apnea
D. hallucinations
E. all of the above

618. Which of the following minerals is important in wound healing?
A. manganese
B. zinc
C. iron
D. copper
E. all of the above

619. The mechanism of action of aminoglycosides is best described by
A. inhibition of DNA synthesis.
B. cell membrane destruction.
C. cell wall damage.
D. inhibition of protein synthesis.
E. none of the above

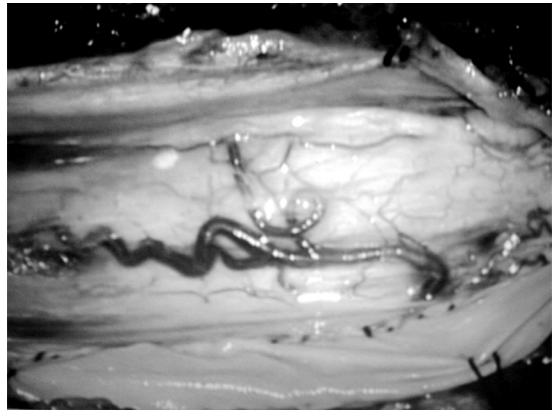
620. Antimicrobial agents causing neuromuscular blockade include all the following EXCEPT:
A. streptomycin
B. kanamycin
C. neomycin
D. polymyxin
E. gentamicin

621. Given the following aneurysm exposed by a far lateral approach (cerebellum retracted), which statement is true?



A. The Allcock test is useful.
B. External ventricular drainage following subarachnoid hemorrhage from this type of aneurysm is an accepted temporizing treatment.
C. Proximal ligation is the preferred treatment.
D. Vasospasm in this area is unlikely to cause respiratory compromise.
E. A lumbar drain is contraindicated in this case.

622. In the following tumor resection case, which of these statements is FALSE?



A. The dura needs to be opened at either end well past the lesion.
B. Dilated veins are more likely to be encountered at the rostral end of the mass.
C. Myelotomy is to be done as close to the midline as possible.
D. Intracapsular decompression of the tumor is necessary to avoid any traction.
E. C-arm guidance for localization may be helpful.

623. Accumulations seen in metachromatic leukodystrophy are
- **A.** sulfatides.
- **B.** galactocerebroside.
- **C.** ganglioside.
- **D.** long chain fatty acids.
- **E.** none of the above

624. The T-reflex represents
- **A.** flexor response as seen in decerebrate rigidity.
- **B.** crossed extensor reflex.
- **C.** monosynaptic stretch reflex.
- **D.** supramaximal stimulation of a mixed motor-sensory nerve.
- **E.** all of the above

625. The trochlear nerve arises from the brainstem at the level
- **A.** of the lower pons.
- **B.** of the upper pons.
- **C.** of the lower midbrain.
- **D.** of the upper midbrain.
- **E.** none of the above

626. A 57-year-old man with a known history of lung cancer presents with generalized muscle weakness. The most likely associated finding is
- **A.** opsoclonus.
- **B.** increased glutamic acid decarboxylase.
- **C.** anti–Purkinje cell antibodies.
- **D.** presynaptic acetylcholine receptor disorder.
- **E.** multiple sclerosis.

627. To produce a 1 mEq/L rise in serum potassium, the total body potassium stores need to increase by which quantity?
- **A.** 50 mEq
- **B.** 150 mEq
- **C.** 350 mEq
- **D.** 500 mEq
- **E.** 1000 mEq

628. If the C6 nerve root is severed, all the following may be affected EXCEPT:
- **A.** lateral cord
- **B.** ulnar nerve
- **C.** musculocutaneous nerve
- **D.** median nerve
- **E.** lower subscapular nerve

For the innervation specified in questions **629** to **634**, choose the plexus option that is correct.

A. brachial plexus
B. cervical plexus
C. lumbar plexus
D. cervical and brachial plexuses
E. none of the above

629. Inferior belly of the omohyoid

630. C5 nerve root

631. Obturator nerve

632. Levator scapulae

633. External urethral sphincter

634. Sternocleidomastoid

635. Which of the following is a characteristic of narcolepsy?
A. hallucinations while sleeping
B. convulsions while sleeping
C. daytime hyperalertness
D. NREM onset of sleep
E. gelastic seizures

For the clinical disorders in questions **636** to **639**, choose the vitamin excess or deficiency option that is correct.

A. thiamine
B. B_6
C. cobalamine
D. niacin
E. vitamin A

636. Pseudotumor

637. Wet Beriberi

638. Increased serum homocysteine

639. Lower extremity paraesthesias

For the pharmacologic agents in questions **640** to **643**, choose the option that is correct.

A. type A GABA agonist
B. type B GABA agonist
C. GABA antagonist
D. no effect on GABA receptors

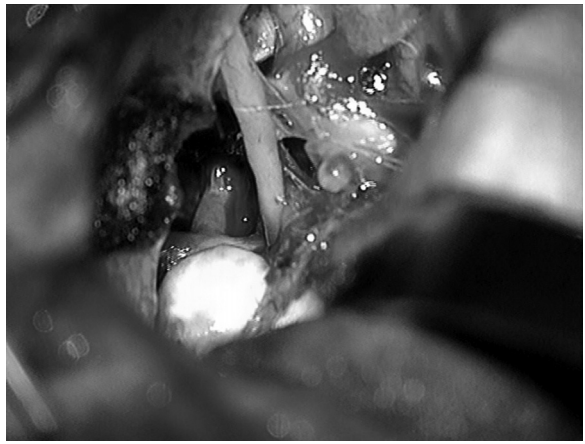
640. Barbiturates

641. Picrotoxin

642. Baclofen

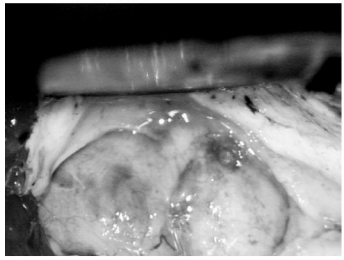
643. Bicuculine

644. The two aneurysms seen in this intraoperative picture are



A. anterior communicating and superior hypophyseal.
B. basilar and anterior communicating.
C. PICA and superior hypophyseal.
D. PICA and basilar.
E. basilar and posterior communicating.

645. The transcallosal approach for tumor resection shows the following lesion. The pertinent MRI is also shown. Which of the following statements is FALSE?



A. A common presenting sign is papilledema.
B. It arises from the diencephalic recess of the postvelar arch.
C. Risk of sudden death is attributable to CSF dynamics or disturbances in hypothalamic-related cardiovascular control.
D. Lumbar puncture is part of the initial workup.
E. The patient may require a shunt postoperatively.

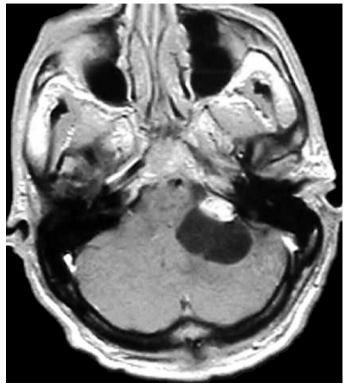
646. All the following are associated with torsade de pointes EXCEPT:
A. phasic changes of amplitude and polarity of ventricular complexes
B. hypokalemia
C. hypomagnesemia
D. narrowed QT intervals
E. may be predisposed by erythromycin

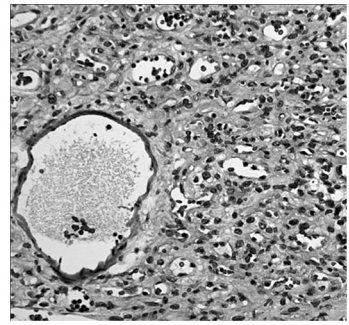
647. Which of the following enables one to distinguish early adult respiratory distress syndrome (ARDS) from early cardiogenic pulmonary edema?
A. In ARDS, the hypoxemia is more pronounced and the chest x-ray abnormalities are more evident.
B. In ARDS, the hypoxemia is less pronounced and the chest x-ray abnormalities are more evident.
C. In ARDS, the hypoxemia is more pronounced and the chest x-ray abnormalities are less evident.
D. In ARDS, the hypoxemia is less pronounced and the chest x-ray abnormalities are less evident.
E. None of the above

648. All of the following are recommended therapeutic measures for diabetic ketoacidosis EXCEPT:

A. insulin
B. alkali therapy
C. potassium
D. crystalloids
E. phosphate

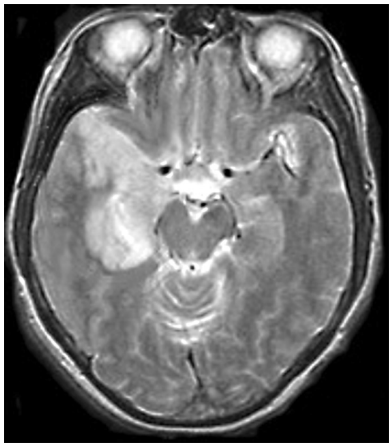
649. A 54-year-old male who is a heavy smoker presents with balance problems; below are his MRI scan and pathology slide from surgery. The most likely diagnosis is





A. metastasis
B. hemangioblastoma
C. glioma
D. CNS lymphoma
E. pilocytic astrocytoma

650. A 64-year-old man was admitted with mental status changes and a temperature of 103.4°F. Spinal fluid was obtained and showed 118 WBC, 49 RBC, 102 protein, and 79 glucose. The patient's MRI is shown here. The most likely diagnosis is

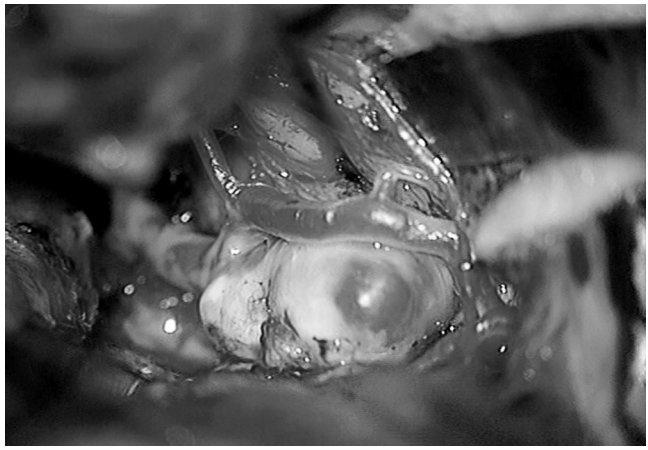


A. glioblastoma multiforme resection.
B. radiation therapy.
C. trauma.
D. encephalitis.
E. aneurysm

651. After a motorcycle accident, a patient is able to dorsiflex and invert his foot but is unable to evert his foot. The most likely nerve lesioned is
A. the deep peroneal nerve.
B. the superficial peroneal nerve.
C. the common peroneal nerve.
D. the sciatic nerve.
E. the tibial nerve.

652. The brachial plexus structure just distal to the division is
A. the trunk.
B. the branch.
C. the cord.
D. the root.
E. none of the above

653. The following intraoperative picture shows a middle cerebral artery bifurcation aneurysm. What is the proper order of steps to ensure safe clipping of this aneurysm?



A. definitive clipping, temporary clipping, fissure splitting, dissection of M2 branch from dome
B. dissection of M2 branch from dome, fissure splitting, temporary clipping, definitive clipping
C. fissure splitting, temporary clipping, dissection of M2 branch from dome, definitive clipping
D. temporary clipping, fissure splitting, dissection of M2 branch from dome, definitive clipping
E. fissure splitting, dissection of M2 branch from dome, temporary clipping, definitive clipping

654. Molecular genetic alterations in glioma, not part of a specific syndrome, include all the following EXCEPT:
A. overexpression of CDK4
B. deletion of p53
C. mutation of retinoblastoma
D. amplification of K-ras
E. overexpression of CDK6

655. Oligodendrogliomas exhibit loss of chromosomal regions on all the following EXCEPT:
- **A.** 1p
- **B.** 7q
- **C.** 9p
- **D.** 19q
- **E.** 22

656. All the following statements are true about the sympathetic nervous system EXCEPT:
- **A.** Stellate ganglionectomy is used in the treatment of long QT syndrome.
- **B.** Anhydrosis occurs with ganglionectomy.
- **C.** Each intercostal nerve is connected to the sympathetic trunk by at least one white ramus and two gray rami.
- **D.** The inferior hypogastric plexus lies in front of the promontory of the sacrum between the two common iliac arteries and is sometimes called the presacral nerve.
- **E.** Sympathetically conveyed stimulus to the sweat glands is transmitted by acetylcholine.

For the statements in questions **657** to **659**, choose the limbic structure option that is correct.
- **A.** cingulate gyrus
- **B.** hippocampus
- **C.** amygdala
- **D.** mammillary bodies
- **E.** anterior nucleus of the thalamus

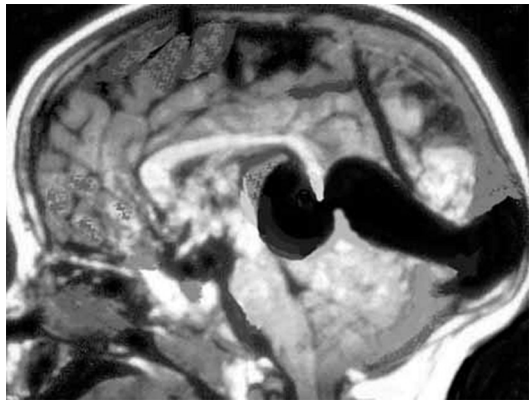
657. Not part of the Papez circuit

658. Receives inputs from the nucleus of the solitary tract

659. Receives inputs from the medial septal nucleus

660. Which of the following has the highest incidence of associated platelet disorders?
- **A.** ALS
- **B.** Huntington's disease
- **C.** acute respiratory distress syndrome
- **D.** AIDS
- **E.** multiple sclerosis

661. Which of the following is NOT associated with the finding on the scan?



A. congestive heart failure
B. pulmonary hypertension
C. renal failure
D. microcephaly
E. subarachnoid hemorrhage

662. All the following are associated with this MRI finding EXCEPT:

A. most common location is cervicothoracic.
B. presence of a malignancy is a predisposing condition.
C. increased incidence with epidural anesthesia
D. incidence is 1:10,000 in the U.S.
E. increased incidence with drug abuse

663. The leading cause of magnesium deficiency is
- **A.** antibiotic therapy.
- **B.** diuretics.
- **C.** secretory diarrhea.
- **D.** diabetes mellitus.
- **E.** Dilantin therapy.

For the nerves in questions **664** to **667**, choose the ganglion option that is correct.
- **A.** jugular
- **B.** nodose
- **C.** pterygopalatine
- **D.** ciliary
- **E.** superior cervical

664. Facial nerve

665. Oculomotor nerve

666. Arnold's nerve

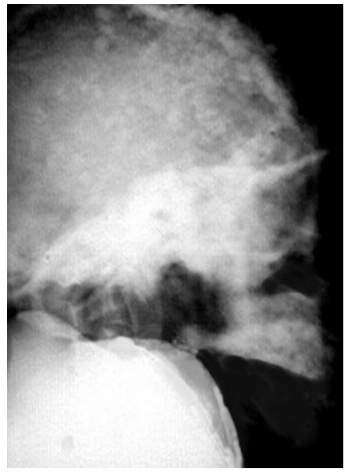
667. Deep petrosal nerve

668. All of the following may be used to differentiate between a lesion of the glossopharyngeal nerve and a lesion of the facial nerve EXCEPT:
- **A.** loss of sensation to the outer ear
- **B.** loss of taste on the tongue surface
- **C.** loss of salivatory secretion from a gland
- **D.** weakness of the pharynx
- **E.** strength of facial muscles

669. The inotropic drug of choice for acute management of systolic heart failure is
- **A.** Dopamine
- **B.** Dobutamine
- **C.** Neosynephrine
- **D.** Epinephrine
- **E.** Isoproterenol

670. The toxicity of nitroprusside in the setting of decreased renal blood flow is mediated
- **A.** by cyanide.
- **B.** by thiocyanate.
- **C.** by nitric oxide.
- **D.** by thiosulfate.
- **E.** by vitamin B_{12}.

For the diseases in questions **671** to **675**, choose the answer option that is correct.



1

2

A. 1
B. 2
C. 1 and 2
D. none of the above

671. Eosinophilic granuloma

672. Langerhans cell histiocytosis

673. Paget's disease

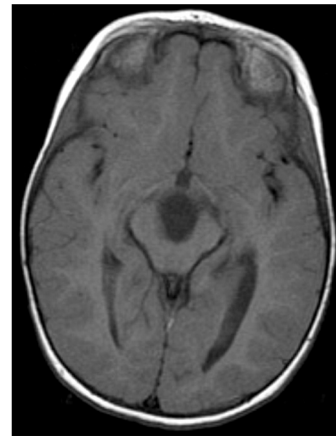
674. Albright's syndrome

675. Epidermoid

676. The most common cause of admission of HIV-infected patients to the ICU is
A. *Pneumocystis carinii* pneumonia.
B. cytomegalovirus infections.
C. toxoplasmosis.
D. AIDS encephalitis.
E. hydrocephalus.

677. An isolated exposure of broken skin or mucous membranes to HIV-infected blood carries a risk of transmission
- **A.** of 9%.
- **B.** of 0.9%.
- **C.** of 0.09%.
- **D.** of 0.009%.
- **E.** of 0.0009%.

678. Differential diagnosis of the following lesion includes the listed choices EXCEPT:

- **A.** chordoma
- **B.** epidermoid
- **C.** basilar tip aneurysm
- **D.** arachnoid cyst
- **E.** low-grade glioma

For the functions in questions **679** to **683**, choose the organelle option that is correct.
- **A.** Golgi organelle
- **B.** endoplasmic reticulum
- **C.** Both A and B
- **D.** none of the above

679. Functional ribosomes occur on the outside of its membrane but not on the inside.

680. Phosphorylation of oligosaccharides

681. Important in drug detoxification

682. Glycogen formation and breakdown

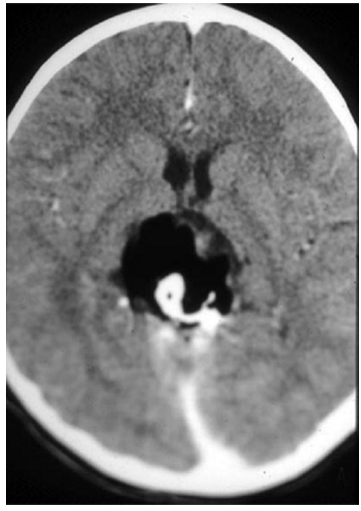
683. Lamellar or tube-like membranous system

684. Neuromelanin has the following characteristics EXCEPT:
- **A.** accumulates in neurons of the substantia nigra
- **B.** found in the locus ceruleus
- **C.** made by tyrosinase
- **D.** is a catecholamine waste product
- **E.** chelates metal ions such as aluminum and iron

685. Amygdala afferents include all the following EXCEPT:
- **A.** nucleus accumbens
- **B.** pyriform cortex
- **C.** solitary tract nucleus
- **D.** locus ceruleus
- **E.** prefrontal cortex

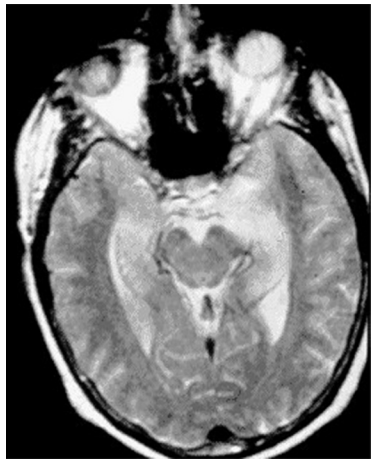
686. All the following are complications of total parenteral nutrition EXCEPT:
- **A.** hypercapnia
- **B.** acalculous cholecystitis
- **C.** impaired oxygenation
- **D.** calculous cholecystitis
- **E.** increased incidence of infection

687. Which of the following findings is most closely associated with the lesion on this scan?



- **A.** may have elevated carcinoembryonic antigen (CEA) levels
- **B.** associated with Schiller-Duval bodies
- **C.** derived from extraembryonic tissue
- **D.** ingestion of food with fecal contamination
- **E.** none of the above

688. Which of the following is this scan of a seizure patient associated with?



A. anti-Yo antibodies
B. anti-Hu antibodies
C. anti-Ri antibodies
D. antibodies to presynaptic voltage gated receptors
E. none of the above

689. Match the finding on this myelin stained section with the most likely associated presentation:

A. a 40-year-old man with chronic encephalitis and Argyll-Robertson pupils
B. a 15-year-old hyperglycemic patient with severe lower extremity weakness
C. a 55-year-old man with spastic gait, weakness, and fasciculation in all extremities
D. a 4-year-old boy with bilateral symmetric proximal limb weakness
E. none of the above

For the disorders in questions **690** to **693**, choose the answer option that is correct.

A. respiratory acidosis
B. respiratory alkalosis
C. both
D. neither

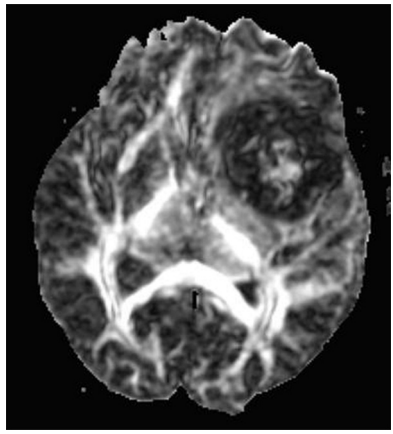
690. Pulmonary embolism

691. Meningitis

692. Liver cirrhosis

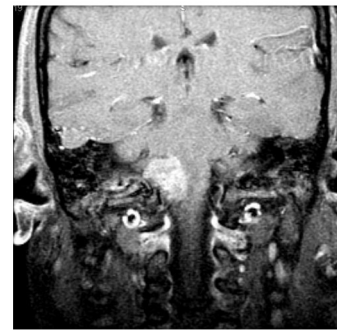
693. Aminoglycosides

694. All the following statements are correct regarding this diffusion tractography scan EXCEPT:



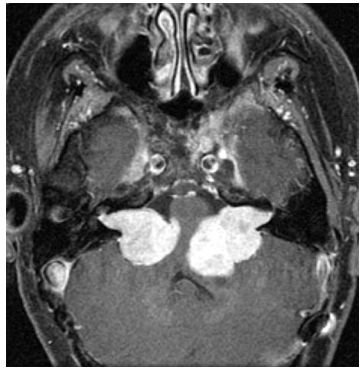
A. Water diffusion is hindered anteriorly by the presence of a large tumor.
B. Connections between frontal and occipital lobe are impaired bilaterally.
C. There are intersecting white matter tracts between the splenium and the fronto-occipital tracts.
D. Tractography gives information about direction of flow.
E. Bundles of axons provide a barrier to perpendicular diffusion and a path for parallel diffusion along the orientation of the fibers.

695. Which of the following is true regarding the finding on this MRI scan?



A. associated with dermal sinus tract
B. secretes histamine
C. on histopathology, may see densely packed elongated spindle cells in interlocking fascicles with a tendency toward pallisading
D. all of the above are true
E. none of the above are true

696. All of the following findings may be associated with this MRI scan EXCEPT:



A. abnormality in protein merlin
B. posterior capsular lens opacities
C. intertriginous freckling
D. pigmented area of skin with excess hair
E. may be associated with an autosomal disorder located on chromosome 22

697. Etiologies of distal renal tubular acidosis include all of the following EXCEPT:
- **A.** amphotericin B
- **B.** lithium
- **C.** toluene
- **D.** carbonic anhydrase inhibitors
- **E.** cyclamate

698. Which of the following is NOT a valid therapeutic measure in patients with addisonian crisis?
- **A.** hydrocortisone sodium succinate (Solu-Cortef) for glucocorticoid emergencies
- **B.** fludrocortisone (Florinef) for mineralocorticoid emergencies
- **C.** methylprednisolone (Solu-Medrol) for glucocorticoid emergencies
- **D.** cortisone acetate for glucocorticoid emergencies
- **E.** intravenous fluids

699. Therapeutic measures for syndrome of inappropriate secretion of antidiuretic hormone (SIADH) include
- **A.** furosemide.
- **B.** phenytoin.
- **C.** lithium.
- **D.** all of the above
- **E.** none of the above

700. Which compatible plasma types can be given to a patient with blood type B?
- **A.** B and O plasma types
- **B.** B and AB plasma types
- **C.** B plasma type only
- **D.** all of the above
- **E.** none of the above

701. Neurogenic shock is characterized by which of the following?
- **A.** increased arteriolar tone
- **B.** increased in peripheral vascular resistance
- **C.** cool molten skin
- **D.** hypertension
- **E.** bradycardia

702. Gram negative septicemia in hospitalized patients is MOST likely to originate from
- **A.** urinary tract infection.
- **B.** pneumonia.
- **C.** wound infection.
- **D.** gastrointestinal infection.
- **E.** pressure ulcers.

703. Which of the following tests has the highest sensitivity in diagnosing *Clostridium difficile* colitis?
- **A.** latex agglutination test
- **B.** tissue culture assay for cytotoxin
- **C.** stool culture
- **D.** stool microscopy
- **E.** polymerase chain reaction (PCR) analysis

For the properties in questions **704** to **707**, choose the anesthetic option that is correct.
- **A.** isoflurane
- **B.** enflurane
- **C.** thiopental
- **D.** halothane

704. Increases cerebral blood flow the most

705. Decreases intracranial pressure

706. Transient tachycardia in children

707. Increases systemic vascular resistance

For the syndromes in questions **708** to **711**, choose the option that is correct.
- **A.** neurofibromatosis type 1
- **B.** neurofibromatosis type 2
- **C.** both A and B
- **D.** none of the above

708. Autosomal-dominant inheritance

709. Retinal hemangioma

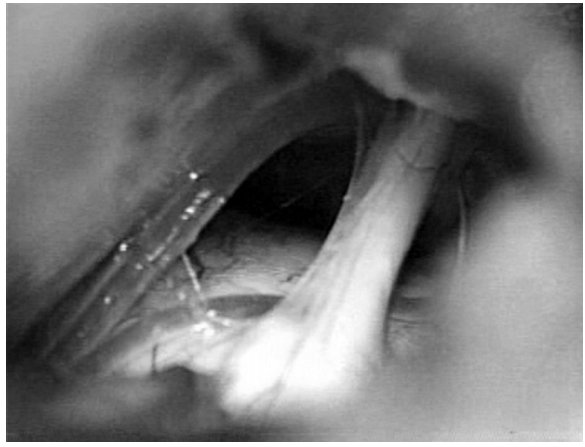
710. Iris hamartoma

711. Segmental and confined to one part of the body

712. This is an intraoperative picture showing clipping of an ophthalmic artery aneurysm. With regard to the neck of the aneurysm, which statement is true?

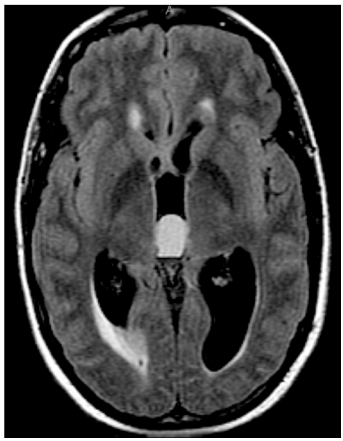
A. The neck of the aneurysm is unobstructed.
B. The neck of the aneurysm is obstructed by the dome.
C. The neck of the aneurysm is obstructed by the optic nerve.
D. The neck of the aneurysm is obstructed by the carotid artery.
E. The neck of the aneurysm is obstructed by the anterior clinoid process.

713. During microvascular decompression for trigeminal neuralgia, the following intraoperative picture is taken and the offending artery is seen. What is the artery and what structure does it come close to more proximally in this picture?



A. superior cerebellar artery, abducens nerve
B. anterior inferior cerebellar artery, trochlear nerve
C. superior cerebellar artery, trochlear nerve
D. anterior inferior cerebellar artery, abducens nerve
E. superior cerebellar artery, oculomotor nerve

714. Which of the following is the LEAST favorable therapeutic approach for the lesion depicted on the MRIs?



A. supracerebellar infratentorial approach for cyst resection
B. midline frontal approach for cyst resection
C. third ventriculostomy
D. midline frontal approach for cyst decompression
E. endoscopic cyst resection

For the effects in questions **715** to **719**, choose the correct medication option.

A. meperidine
B. thyroid hormones
C. fluconazole
D. papaverine

715. Inhibits antiparkinsonism effect of levodopa

716. Increases serum phenytoin levels

717. Enhances clotting factor catabolism

718. Decreases warfarin metabolism

719. May cause hypertension, rigidity, and excitation when used with monoamine oxidase inhibitors

720. Which of the following medications is safe to use in a patient with history of malignant hyperthermia?
- **A.** epinephrine
- **B.** isoflurane
- **C.** halothane
- **D.** thiopental
- **E.** all of the above

721. Which of the following neoplasms is LEAST likely to metastasize to the spine?
- **A.** lung carcinoma
- **B.** breast carcinoma
- **C.** colon carcinoma
- **D.** renal cell carcinoma
- **E.** prostate carcinoma

722. In relation to what vessel are the cords of the brachial plexus named?
- **A.** brachiocephalic artery
- **B.** axillary artery
- **C.** subclavian artery
- **D.** brachial artery
- **E.** internal carotid artery

723. Which type of spondylolisthesis is most common in gymnasts and football players?
- **A.** traumatic
- **B.** degenerative
- **C.** isthmic
- **D.** pathologic
- **E.** dysplastic

For questions **724** to **729**, choose the visual disturbance option that is correct.
- **A.** homonymous hemianopia
- **B.** upper homonymous quadrantanopia
- **C.** bilateral central scotomas
- **D.** monocular loss of vision with contralateral upper outer quadrantanopia
- **E.** lower homonymous quadrantanopia

724. Lesion of the optic nerve just distal to the chiasm

725. Occipital lobe infarction

726. PICA interruption

727. Methyl alcohol

728. Temporal lobe lesion

729. Parietal lobe lesion

For questions **730** to **732**, choose the anatomic structure that is correct.

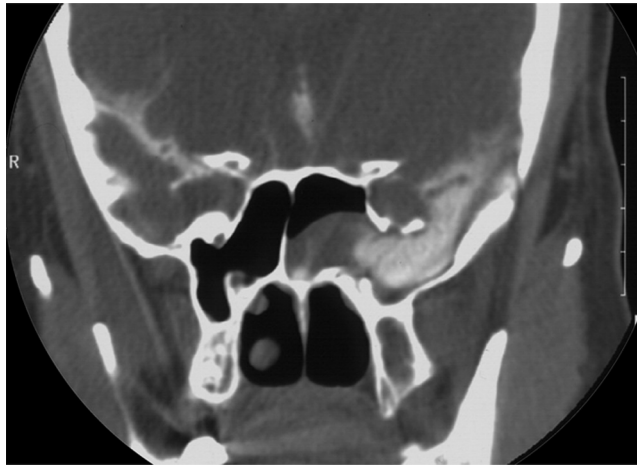
A. Struthers' ligament
B. arcade of Struthers
C. arcade of Frohse
D. Guyon's canal

730. Ulnar nerve entrapment

731. Extensor carpi ulnaris palsy

732. Brachial artery passes under this structure

733. Which of the following is the LEAST likely presenting sign in a patient with rhinorrhea and the following metrizamide CT scan finding?



A. reservoir sign
B. early morning headache
C. meningitis
D. visual deficits
E. sinus congestion

734. Of the following signs and symptoms, which is the most common in the presentation of an osteoid osteoma?
- **A.** radicular pain
- **B.** scoliosis
- **C.** weakness
- **D.** atrophy
- **E.** none of the above

735. Of the following signs and symptoms, which is the most common in the presentation of an osteoblastoma?
- **A.** radicular pain
- **B.** scoliosis
- **C.** weakness
- **D.** atrophy
- **E.** none of the above

736. What mechanisms lead to neurologic deficits in patients with vertebral hemangiomas?
- **1.** Epidural growth of the tumor
- **2.** Expansion of bone with widening of the pedicle and lamina
- **3.** Compression fracture of the involved vertebrae
- **4.** Spinal cord ischemia due to steal phenomenon

- **A.** 1, 2, and 3
- **B.** 1 and 3
- **C.** 2 and 4
- **D.** 1, 2, 3, and 4

737. DeQuervain's syndrome is characterized by all the following EXCEPT:
- **A.** caused by frequent repetitive motion at the wrist
- **B.** pain and tenderness occurs in the wrist, near the thumb
- **C.** Finkelstein test is positive
- **D.** nerve conduction velocities are decreased
- **E.** difficulty gripping

For the locations in questions **738** to **741**, choose the answer option that is correct.
- **A.** fourth ventricle roof
- **B.** fourth ventricle floor
- **C.** both of the above
- **D.** neither of the above

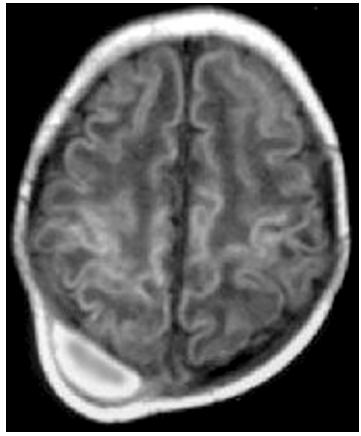
738. Inferior medullary velum

739. Facial colliculus

740. Hypoglossal trigone

741. Rhomboid fossa

742. What is the best therapeutic option in a 1-year-old with the following lesion on MRI?



A. surgical evacuation
B. systemic antibiotics
C. head wrapping
D. radiation therapy
E. VP shunt

743. The dorsal horn of the spinal cord is derived from
- **A.** the basal plate.
- **B.** the notochord.
- **C.** the neural crest cells.
- **D.** the somites.
- **E.** the endoderm.

For the lesion locations in questions **744** to **747**, choose the breathing pattern option that is correct.
- **A.** Cheyne-Stokes respiration
- **B.** apneustic respiration
- **C.** ataxic respiration
- **D.** central neurogenic hyperventilation

744. Medulla

745. Midbrain

746. Pons

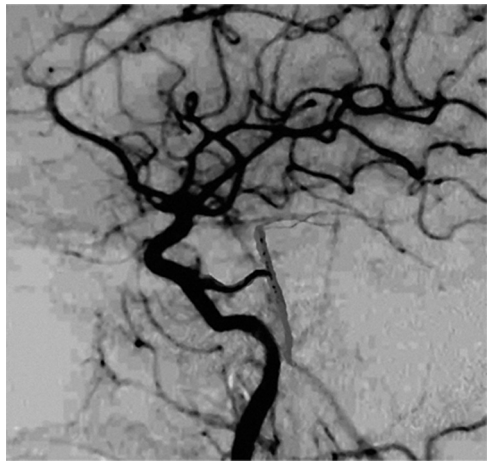
747. Diencephalon

For the descriptions in questions **748** and **749**, choose the cerebellar element option that is correct.
- **A.** middle cerebellar peduncle
- **B.** inferior cerebellar peduncle
- **C.** nodulus
- **D.** flocculus
- **E.** none of the above

748. Devoid of pontine inputs

749. Contains only afferent fibers

750. All the following are associated with this angiogram finding EXCEPT:



A. connects the basilar artery between the superior cerebellar and the anterior inferior cerebellar arteries by passing through the petrous bone
B. connects the basilar artery by passing through the internal auditory meatus
C. present in 0.1% of the population
D. increased frequency of arteriovenous malformations
E. second most common persistent fetal circulation

For the needlestick injury infections in questions **751** to **753**, choose the risk rates' option that is correct.

A. 75%
B. 50%
C. 25%
D. 2%
E. 0.3%

751. The risk of acquiring HIV from a hollow needle stick injury from an affected individual

752. The risk of acquiring hepatitis C from a hollow needle stick injury from an affected individual

753. The risk of acquiring hepatitis B from a hollow needle stick injury from an affected individual with an extremely low viral load

754. The following scan of a 35-year-old woman on hormonal contraceptives is most consistent with the diagnosis of

A. tentorial subdural hemorrhage.
B. subarachnoid hemorrhage.
C. normal CT scan.
D. dural sinus thrombosis.
E. arteriovenous fistula.

755. All the following are features of malignant hyperthermia (MH) EXCEPT:
A. autosomal-recessive inheritance pattern
B. in 20% of cases there is no hyperthermia accompanying the muscle rigidity
C. may be associated with autonomic instability
D. may be caused by muscle relaxants
E. a mutation in the ryanodine receptor is related to MH

756. Which of the following is the lesion on this MRI scan associated with?

A. cerebral aneurysm
B. arteriovenous malformation
C. endocrinopathy
D. venous angioma
E. progressive supranuclear palsy

757. Which of the following changes are represented at the end plates of L4-L5 levels on this T2-weighted MRI?

A. type 1 modic changes
B. type 2 modic changes
C. yellow marrow replacement
D. hypovascularization of the end plates
E. all of the above

758. All of the following neurological deficits may be present with the lesion seen on this MRI EXCEPT:

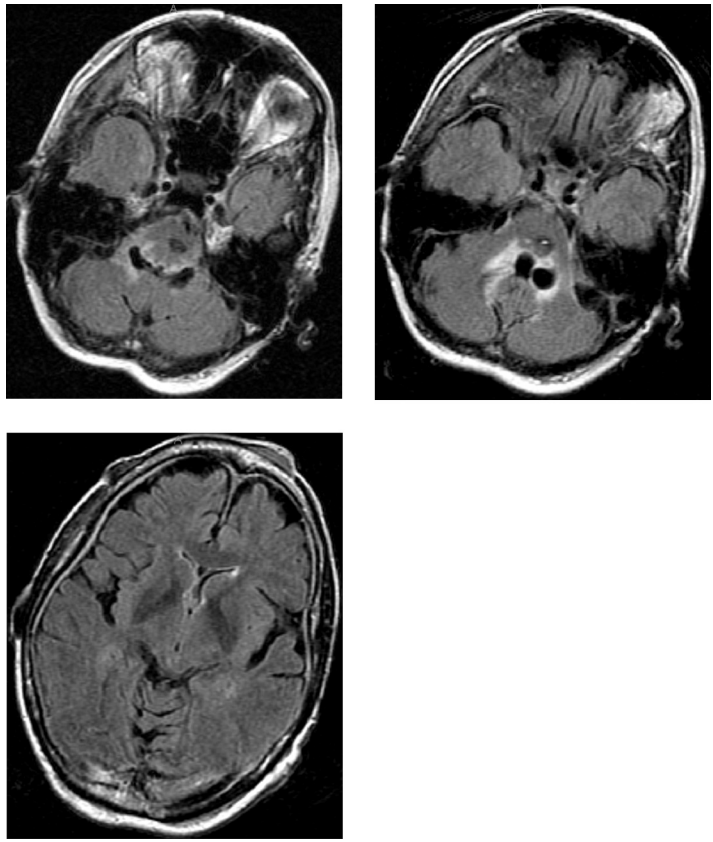
A. ataxia
B. ipsilateral hearing deficits
C. contralateral temperature sensation loss
D. lateral rectus palsy
E. balance problems

759. Which anesthetic agent is LEAST likely to cause further decrease in blood pressure in the face of hypovolemic shock?
A. ketamine
B. thiopental
C. halothane
D. enflurane
E. isoflurane

760. Which of the following statements is NOT associated with the following images?

A. Froin's syndrome
B. positive Queckenstedt's test
C. male predominance with peak age in mid-40s
D. cellular type
E. neoplastic disease

761. Which of the following is associated with the following set of MRI scans in a patient with a functional ventriculoperitoneal shunt placed on the right side?



A. syringobulbia
B. elevated serum angiotensin-converting enzyme
C. aqueductal stenosis
D. Hallervorden-Spatz disease
E. subdural hematoma

For the functions in questions **762** to **765**, choose the answer option that is correct.

A. proximal renal tubular function
B. distal renal tubular function
C. kidney glomerular function
D. none of the above

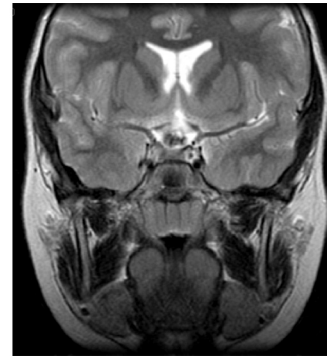
762. Secretion of H^+ and reabsorption of Cl

763. Secretion of organic acids and reabsorption of amino acids

764. Secretion of K^+ and reabsorption of Na^+

765. Function is maximal in young adulthood and decreases thereafter

766. Which of the following prognostic factors is true in the case of a 16-year-old boy with failure to thrive and the following findings on MRI?



A. The most significant factor associated with recurrence is extent of resection.
B. The most significant factor associated with recurrence is histology.
C. MIB-1 LI >7% is associated with low likelihood of recurrence.
D. Malignant transformation to carcinoma frequently occurs.
E. Recurrence is dependent on the presence of intracytoplasmic inclusions.

767. The following tumor shows on histopathology uniform round cells with perinuclear halos. Its immunhistochemistry is positive for synaptophysin. What is the most likely diagnosis?

A. central neurocytoma
B. oligodendroglioma
C. ependymoma
D. endodermal sinus tumor
E. yolk sac tumor

768. The inferior frontal gyrus is bordered by which structure caudally?
A. operculum
B. sylvian fissure
C. precentral sulcus
D. rolandic fissure
E. none of the above

769. The actions of nitroglycerine are mediated by the following mechanisms EXCEPT:
A. Nitroglycerine binds the surface of endothelial cells.
B. Nitroglycerine undergoes two chemical reductions to form nitric oxide.
C. Nitric oxide promotes the formation of cyclic guanosine triphosphate.
D. Nitric oxide moves out of the endothelial cell into adjacent smooth muscle cells.
E. Nitric oxide has also been referred to as endothelium-derived relaxing factor.

For the patient presentations in questions **770** to **772**, choose the closest relative risk of stroke option that is correct.

A. 1% per year
B. 2% per year
C. 4% per year
D. 13% per year
E. 26% per year

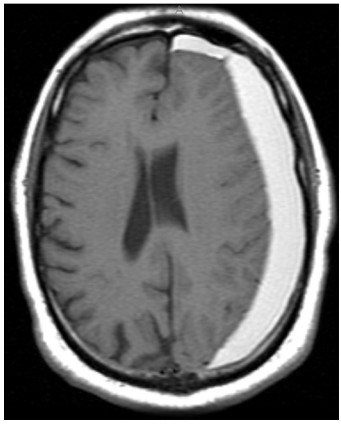
770. Symptomatic 70 to 90% stenosis of the carotid on angiogram

771. Asymptomatic 70 to 90% stenosis of the carotid on angiogram

772. Post–carotid endarterectomy in a preoperative symptomatic 70 to 90% stenosis of the carotid on angiogram

773. Which of the following causes hypokalemia?
A. amphotericin
B. angiotensin-converting enzyme inhibitors
C. aspirin
D. cyclosporine
E. heparin

774. What is the most likely age of the following hemorrhage?



A. 2 hours
B. 2 days
C. 12 days
D. 22 days
E. 32 days

For the characteristics in questions **775** and **776**, choose the substance option that is correct.

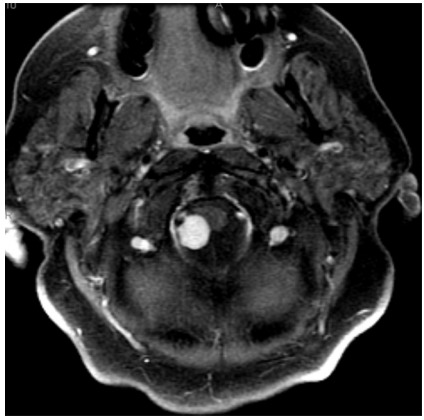
A. ethanol
B. acetone
C. methanol
D. ethylene glycol (antifreeze)

775. Lowest molecular weight

776. Most lethal

777. A patient with von Willebrand's disease sustained a motorcycle crash and is losing blood from an open fracture. The blood product best suited for management is
A. whole blood.
B. fibrinogen.
C. platelets.
D. packed red blood cells.
E. cryoprecipitate.

778. Which of the following is least likely to be associated with the finding on this MRI scan?



A. ipsilateral Horner's
B. downbeat nystagmus
C. loss of abdominal cutaneous reflex
D. neurogenic bladder
E. extremity weakness

779. Typical presentation of patients with conus medullaris lesions include all the following EXCEPT:
- **A.** Bilateral sensory deficit
- **B.** Symmetric motor loss
- **C.** Loss of ankle jerk but preserved knee jerk
- **D.** Autonomic symptoms occur late
- **E.** Urinary retention and atonic anal sphincter cause overflow urinary incontinence and fecal incontinence.

780. Typical presentation of patients with cauda equina lesions include all the following EXCEPT:
- **A.** Sensory dissociation
- **B.** Asymmetric motor loss
- **C.** Late autonomic symptoms
- **D.** Absence of ankle jerk and knee jerk
- **E.** Numbness tends to be more localized to saddle area.

781. Which of the following structures is the second branch of the proximal aorta as it exits the left ventricle?
- **A.** brachiocephalic artery
- **B.** right subclavian artery
- **C.** left subclavian artery
- **D.** right carotid artery
- **E.** left carotid artery

782. Bilateral internuclear ophthalmoplegia results in which abnormality on physical exam?
- **A.** convergence deficit
- **B.** adduction deficit
- **C.** downward gaze palsy
- **D.** vertical gaze palsy
- **E.** Parinaud's syndrome

For the areas of the brain in questions **783** to **785**, choose the neurotransmitter option that is correct.

A. acetylcholine
B. noradrenaline
C. dopamine
D. GABA
E. glutamate

783. Inferior cervical ganglion

784. Locus ceruleus

785. Periaqueductal gray

786. In which disorder of speech is both repetition and comprehension affected?

1. transcortical sensory aphasia
2. Wernicke's aphasia
3. conductive aphasia
4. global aphasia

A. 1, 2, and 3
B. 1 and 3
C. 2 and 4
D. 4
E. 1, 2, 3, and 4

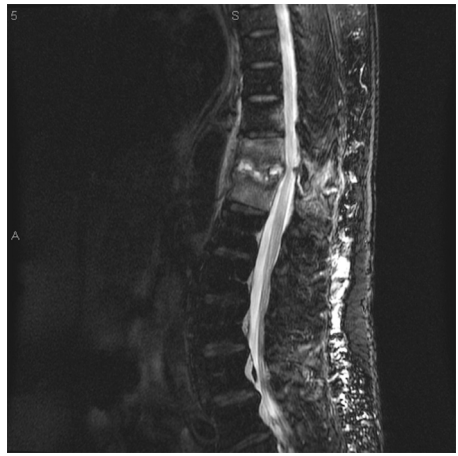
787. Watershed infarcts are seen in all the following EXCEPT:

A. regional hypotension
B. CBF below critical level
C. atrial fibrillation
D. cardiac arrest
E. anaphylaxis

788. Which of the following arteries arises directly from the intracavernous carotid?

A. artery of Bernasconi-Cassinari
B. persistent stapedial artery
C. Heubner's artery
D. McConnell's capsula arteries
E. vidian artery

789. All the following statements are true regarding the findings of the following scan EXCEPT:



A. Fom 30 to 50% of patients are febrile.
B. Spontaneous fusion of vertebral bodies may occur.
C. *H. influenzae* may be a causative organism in juvenile cases.
D. Radionuclide scans have a relatively low sensitivity.
E. Increased incidence with intravenous drug abuse.

790. What is the significance of an elevated *N*-acetylaspartate (NAA) peak on an MR spectroscopy scan?
A. increased neuronal density
B. increased metabolism
C. increased excitatory neurotransmission
D. necrosis
E. none of the above

Questions **791** and **792** are based on this radiograph.

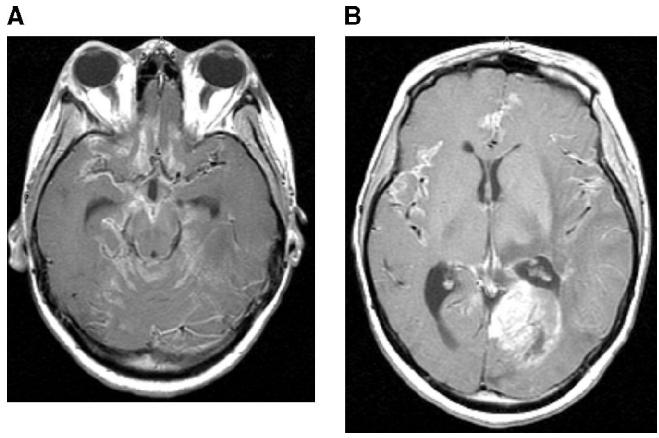
791. Choose the correct answer based on the MRI finding in a 20-year-old woman with Hodgkin's lymphoma and an opportunistic infection. The most likely organism is

A. mucor.
B. *Aspergillus.*
C. coccidioidomycosis.
D. amebiasis.
E. viral.

792. Characteristic features of this organism include all the following EXCEPT:

A. perivascular invasion
B. hemorrhagic infarcts
C. may cause paranasal sinus mycetoma
D. Caseating granulomas are common.
E. increased prevalence with the use of chemotherapy and corticosteroids

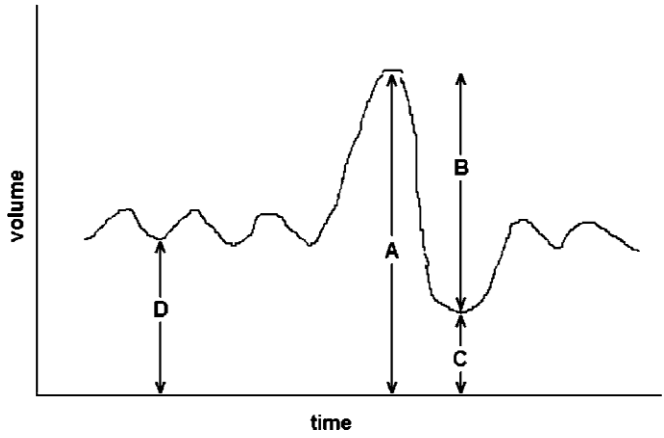
793. What is the best treatment option in a 63-year-old woman with mental status changes and the following imaging study?



A. intravenous antibiotics
B. surgical resection
C. systemic chemotherapy and whole brain radiation
D. Ommaya reservoir placement and intrathecal chemotherapy
E. ventriculoperitoneal shunt

794. Which of the following muscles is innervated by the glossopharyngeal nerve?
A. stapedius
B. tensor veli palatini
C. stylopharyngeus
D. posterior belly of digastric
E. none of the above

For the measurements in questions **795** to **798**, choose the correct answer from this lung volume spirogram:



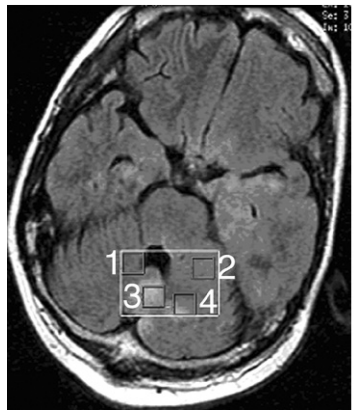
795. Equals 2.4 L at rest and 2.4 L during exercise

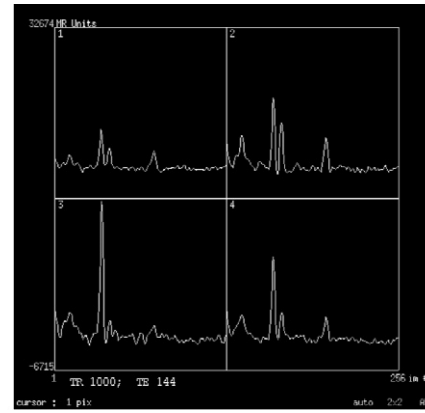
796. Represents vital capacity minus expiratory reserve volume

797. Measured at about 4.4 to 5 L in healthy adults

798. Calculated after having patient inspire a mixture containing 10% helium from a spirometer at 21°C

Questions **799** and **800** are based on the following MR spectroscopy study:





799. Point 1 being closest to normal and point 3 showing the most abnormality, which of the following statements with regard to spectroscopy is correct regarding point 3?

A. elevated *N*-acetylaspartate (NAA) peak and normal Choline (Chol) and Creatine (Cr) peaks
B. elevated Cr peak and decreased Chol and NAA peaks
C. increased Chol/Cr ratio and decreased NAA peak
D. increased Cr/Chol ratio and decreased NAA peak
E. all of the above

800. What do these MR spectroscopy findings most likely represent?

A. increased astrocytic density at point 3 as compared with point 1
B. presence of tumor cells at point 3
C. presence of necrosis at point 3
D. increased metabolism at point 3
E. all of the above

801. Which of the following is represented by "*X*" in this formula?
X = (Cardiac output) (Arterial O_2 content – venous O_2 content)
A. oxygen delivery
B. oxygen uptake
C. oxygen extraction ratio
D. oxygen content
E. none of the above

802. Which of the following formulas describes shunt fraction?
Pulmonary capillary O_2 content = Cc O_2
Venous O_2 content = Cv O_2
Arterial O_2 content = Ca O_2
A. Cc O_2 – Ca O_2 / Cv O_2 – Ca O_2
B. (Cc O_2 – Cv O_2)/ (Cc O_2 – Ca O_2)
C. Cc O_2 – Ca O_2 / Cc O_2 – Cv O_2
D. (Cc O_2 – Ca O_2)/ (Cc O_2 – Cv O_2)
E. (Cc O_2 – Ca O_2)/ (Cv O_2 – Ca O_2)

803. Which of the following is the formula for flow (Q) of nonpulsatile fluids?
P = pressure
r = radius
L = length
V = viscosity
A. $Q = P\pi r^4/8\ VL$
B. $Q = 8\ PL/V\pi r^4$
C. $Q = V\pi r^4/8\ PL$
D. $Q = 8\ V\pi r^4/PL$
E. None of the above

804. A prisoner with suicidal tendencies is brought to the emergency room after stabbing himself in the eye with a pencil. The patient is started on broad-spectrum antibiotics and antiseizure medication, and taken immediately for open surgical debridement. The following CT scan is taken. The foreign object should be removed

A. immediately in the ER.
B. before getting a CT scan.
C. in the operating room.
D. before antibiotics are given.
E. after the patient has been stabilized in the field

805. A 48-year-old woman presents with progressive myelopathy and difficulty walking for several months. Her MRI and CT scans are shown. What would be the best management of the offending lesion?

A. single-level anterior cervical discectomy and fusion (ACDF)
B. two-level ACDF
C. posterior decompression
D. cervical corpectomy and fusion
E. three-level ACDF

Answers

1.D. All three are mechanisms of antiacetylcholine receptor antibodies.

2.B. The medial lemniscus (ML) is widely separated from the anterolateral system (ALS) in the medulla. In fact, ML and ALS fibers receive different blood supplies in the medulla. In the midbrain and pons, the ML and ALS are in close proximity and receive similar blood supplies.

3.E. Sodium hydroxide (2N) for 1 hour is the current standard for decontamination after CJD cases. Characteristic features of CJD include ataxia, myoclonus, and dementia. Death usually occurs within 1 year after onset of symptoms.

4.A. McRae's line is from the basion to the opisthion.

5.C. It is helpful to remember that this pattern of somatotopy can be appreciated in the descending motor pathways: those tracts that are concerned with flexor musculature (corticospinal tract and rubrospinal tract) lie dorsal to those tracts concerned with extensor musculature.

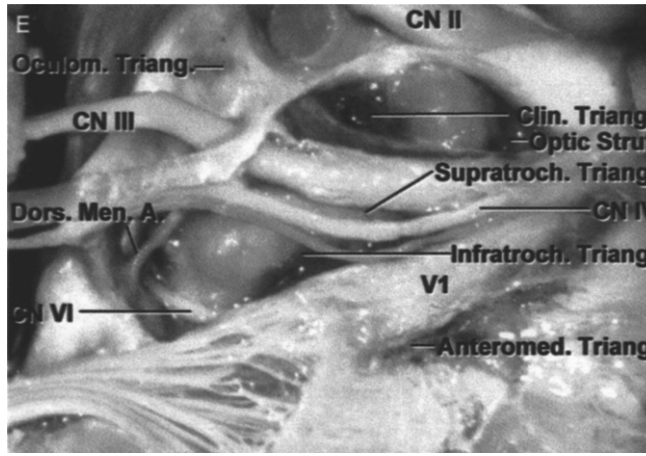
6.D. All tissues increase oxygen extraction in the face of decreased blood flow except the coronary circulation, which is flow dependent.

7.A. Rhinocerebral mucormycosis on pathology reveals pleomorphic short and wide nonseptate hyphae. It can be treated with Cancidas, Voriconazole, and AmBisome. It may cause hemorrhagic necrosis and ischemic strokes. The organism originates in the soil.

8.B. Somatic motor efferents to the sphincter are located in the ventral lateral area of Onuf's nucleus. Sacral parasympathetics to the bladder are located in intermediolateral cell columns of the sacral cord. Barrington's nucleus is also known as the pontine micturition center and is responsible for initiating the process of micturition.

9.C. Cerebral ischemia begins when CPP falls below 50 mm Hg.

10.B. The clinoidal triangle is defined by the medial border of the optic nerve and the oculomotor nerve laterally.



11.E. Dysphagia in myasthenia gravis is fatigable, and the patient often relates a history of little difficulty with breakfast, moderate difficulty with lunch, and inability to eat in the evening.

12.E. Skin changes precede muscle abnormalities in dermatomyositis (DM). Polymyositis (PM) is diagnosed by fibrillation potentials on EMG and elevated CPK (creatine phosphokinase) levels (higher than DM). In polymyositis, there is widespread single-fiber necrosis and T cells with macrophages may be found in the muscle fibers. PM is the most frequent inflammatory myopathy.

13.E. *Protein 14–3-3* is elevated in the CSF with destructive diseases of the CNS. This protein is sensitive for Creutzfeldt-Jakob disease, but not specific.

14.B. The posterior cord gives rise to the axillary nerve and the radial nerve as its terminal branches.

15.C. The pterion is located about two fingerbreadths above the zygomatic arch, and a thumb's breadth behind the frontal process of the zygomatic bone; however, the zygomatic bone does not form the pterion.

16.D. Increased dead space is caused by overdistended alveoli (COPD and PEEP), or by decreased blood flow (CHF, pulmonary embolus, emphysema).

17.D. After basilar skull fractures, the most common pathogen is *S. pneumoniae,* and the infection usually occurs within the first few days.

18.D.

19.E. General treatment of ICP is aimed at minimizing these factors.

20.C.

21.B.

22.E. Weber's syndrome involves the base of the midbrain. It is characterized by CN III palsy with crossed hemiplegia. All other syndromes mentioned may have ataxia as part of the clinical findings.

23.A.

24.C. Lesions of the DM thalamus, hippocampus, or temporal cortex cause memory impairment.

25.B. The x-ray shows a cervical rib, usually associated with ulnar nerve weakness and paresthesia, Raynaud's syndrome, and traction meningocele.

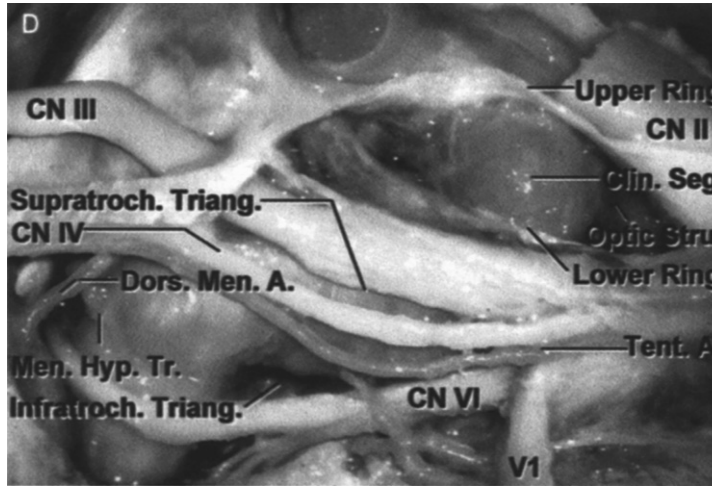
26.A. Positive end-expiratory pressure (PEEP) decreases the work of breathing and the FIO_2 requirement, but it may decrease cerebral perfusion pressure. PEEP increases the physiologic dead space, lung compliance (therefore, decreasing plateau pressure), and risk of barotrauma.

27.E. None of these maneuvers actually reduces infection rate.

28.B. Serotonin pathways inhibit copulation, explaining the side effect of decreased libido with selective serotonin reuptake inhibitors (SSRIs) used to treat depression. Administration of L-dopa increases libido. Noradrenergic receptors in the brain exert an inhibitory effect on penile erection.

29.E. The peak reduction in ICP occurs in ~15 minutes after administration of mannitol. The duration of action of mannitol is ~4 hours due to the rapid renal elimination of the drug. When mannitol is used with furosemide, the combined effect on ICP reduction is greater than if either were used alone.

30.D. Parkinson's (infratrochlear) triangle is located between the lower margin of the trochlear nerve and the upper margin of the opthalmic nerve.



31.D. The Tensilon test is sensitive in diagnosing a defect in neuromuscular transmission, but is not specific for myasthenia gravis (MG). The Tensilon test is especially useful in ocular MG, when other diagnostic tests may be negative. Depending on the mechanism of AchR antibodies, there may be insufficient numbers of AchRs available so that a negative Tensilon test does not negate the diagnosis of MG. There is no correlation between the results of the Tensilon test and the subsequent response to pyridostigmine.

32.D. The posterior interosseous nerve (C7, C8) is a branch of the radial nerve. The posterior interosseous nerve innervates the extensor digitorum, extensor digiti minimi, and the extensor carpi ulnaris. The extensor carpi ulnaris extends the hand at the wrist joint. This muscle is spared in posterior interosseous syndrome.

33.A. The Nernst equation describes the membrane potential produced by a concentration of a diffusible ion across a membrane. E is the voltage produced, R is the gas constant, T is the absolute temperature, z is the ionic charge, F is Faraday's constant, and Q is the ratio of the concentrations on the two sides of the membrane.

34.B. Interruption of the inferior geniculocalcarine fibers in the temporal lobe produces a "pie in the sky" deficit (contralateral superior quadrantanopsia).

35.D. Ocular myoclonus is a pendular vertical oscillation of the eyes, usually of large amplitude and often occurring with movements of the palate. It can develop months to years after bilateral destructive lesions of the central tegmental tract and is often accompanied by bilateral horizontal gaze palsies.

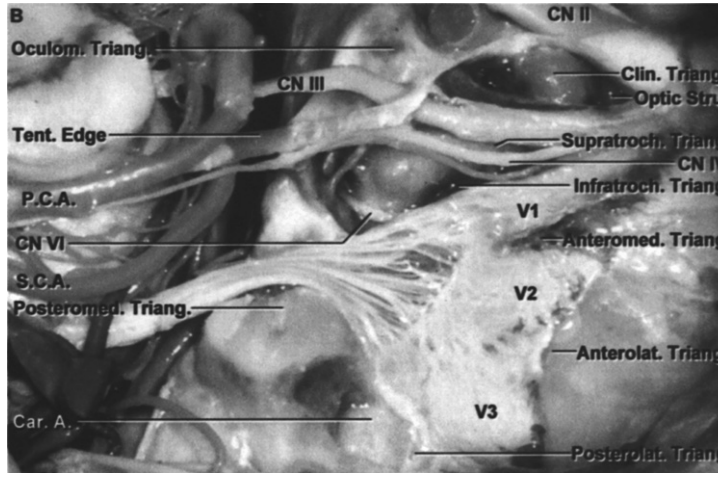
36.A. Early hypoxemia characterizes ARDS.

37.C. Maximum collagen deposition occurs at 42 days (~6 weeks). Tensile strength keeps on increasing until 2 years.

38.B. Rosenthal fibers are by no means a requisite feature of pilocytic astrocytoma. Rosenthal fibers are composed of *alphaB* cystallin and are surrounded by intermediate filaments.

39.E. Barbiturates are also thought to stabilize lysosomes, suppress the formation of edema, and reduce intracellular accumulation of calcium. The inverse steal phenomenon involves barbiturate-induced vasoconstriction resulting in shunting of blood from normal brain to relatively ischemic areas.

40.E.



41.C. The majority of AchR antibodies are immunoglobulin G (IgG). Cyclosporine should be used if first-line treatments have failed. Pathologic abnormalities of the thymus occur in up to 80% of patients. Weakness confined to the ocular muscles for over 3 years suggests good prognosis.

42.D.

43.E. Tolosa-Hunt syndrome is characterized by ocular and retro-orbital pain, ocular motor paralysis, and possibly sensory loss over the forehead with granulomatous inflammation of the superior orbital fissure and/or the lateral wall of the cavernous sinus. The other conditions described lack an inflammatory response.

44.B. The most accurate description of Wernicke's area is that it includes the supramarginal (39), angular (40), and posterior one third of the superior temporal gyri.

45.A. Bursts of back-to-back saccades seen in opsoclonus and ocular flutter may be attributable to a disorder of pause cell modulation of burst cell function.

46.C.

47.A. Scan 1 shows a glomus tympanicum tumor which may be associated with
48.B. catecholamine release causing hypertension, or serotonin and kallikrein
49.A. release causing bronchoconstriction, abdominal pain, and diarrhea.
50.A. Glomus tympanicum tumors may also release histamine and bradykinins
51.D. during surgery, causing hypotension and bronchoconstriction. Scan 2 shows a meningioma of the cerebellopontine angle (CPA), which usually presents initially with facial nerve involvement. Acoustic schwannomas present initially with hearing loss and tinnitus.

52.A. Disseminated intravascular coagulation is most frequently associated with obstetric catastrophes, metastatic malignancy, massive trauma, and bacterial sepsis. The neurosurgeon should be aware that DIC can occur when there is major cerebral tissue injury. The decrease in fibrinogen most closely correlates with increased bleeding. Treatment is aimed at reversing the causative agent, and transfusing heparin, cryoprecipitate, platelets, and/or whole blood.

53.C. The mastoid air cells and the posterior middle fossa are innervated by V_3. The supratentorial compartment is innervated by V_1 and V_2. The infratentorial compartment is innervated by IX, X, and C1–3 posterior roots.

54.D. The band of Gennari divides the fourth layer of cortex into two granular layers with a thick myelin layer. The band is located only in area 17 (primary visual cortex, also known as V_1). When Gennari described this in 1782, he had no idea that this region might be concerned with vision.

55.E. The neural integrator for horizontal eye movements is located in the nucleus prepositus hypoglossi (NPH) at the pontomedullary junction.

56.C. Climbing fiber input is most active at times when the subject is performing new complex movements. The climbing fiber input can modify the synapse between the parallel fiber (from the granule cell) and the Purkinje cell.

57.D. The combination of high trophic hormone and low target hormone indicates target gland failure.

58.D. The opponens pollicis inserts on the first metacarpal bone.

59.A. Resolution of brain edema occurs mainly through bulk flow into the CSF.

60.B.
61.C.
62.A.
63.E.
64.D.

65.C. The MLF is responsible for the binocular coordination of all categories of horizontal, vertical, and oblique eye movements with the exception of vergence movements. Nystagmus on upgaze is a feature of MLF lesions.

66.C. Both Apert's and Crouzon's syndromes are autosomal dominant (both may also be sporadic). Both are associated with bilateral coronal synostosis. Those with Apert's syndrome manifest more severe mental retardation than patients with Crouzon's syndrome.

67.E. In addition to stimulating the synthesis and secretion of TSH, TRH is a potent secretagogue for prolactin, and to a lesser extent ACTH and GH.

68.C. The metacarpophalangeal joint of the ring finger is flexed by the lumbrical, palmar, and dorsal interosseous muscles, which are innervated by the ulnar nerve. The joint is extended by the extensor digitorum, which is innervated by the radial nerve. The median nerve is mainly involved with flexion of the ring finger.

69.C. Interstitial edema is a feature of hydrocephalus.

70.D.

71.E. Serum concentration of PRL is increased after tonic clonic seizure activity, but not affected by nonepileptic seizures.

72.D. The subfornical organ is located on the inferior surface of the fornix at the level of the foramen of Monro.

73.A. The sinuvertebral nerve arises just distal to the dorsal root ganglion. The posterior disk receives its innervation from the sinuvertebral nerves. The anterior disk receives its innervation from the gray rami communicans.

74.B. Repetition is impaired in conduction aphasia.

75.B. The usual diameter of the internal cerebral artery at the clinoid area is ~8 mm. This aneurysm is slightly smaller than the artery's diameter.

76.B. The greatest threat to the patient's life during surgery for craniosynostosis is blood loss and hypothermia.

77.B.

78.C. The medial brachial cutaneous nerve (from the medial cord) contains sensory fibers that have cell bodies in the dorsal root ganglia. It also contains sympathetic postganglionic fibers that have cell bodies in the sympathetic chain ganglia.

79.B. The perforant path is the main excitatory pathway to the hippocampus. When perforant path fibers are stimulated, histological changes develop in the pyramidal nerve cells of CA1 and CA3.

80.C.

81.B. Up to 80% of the population will experience a tension headache in their lifetime. Amitriptyline is the most effective medication used to prevent tension headaches.

82.C. The ambient cistern contains the trochlear nerve.

83.B. The anterior and medial scalene muscles insert onto the first rib, and the subclavian artery, subclavian vein, and brachial plexus pass between them.

84.A. Pure word blindness is characterized by alexia without agraphia. The patient is unable to read, but is able to understand speech, write, and speak. It is caused by a lesion of the left geniculocalcarine tract and the corpus callosum.

85.C. Preventing seepage of blood into the ventricular system during a hemispherectomy is accomplished by obstructing the foramen of Monro and maintaining the integrity of the septum pellucidum.

86.A. Experiments in functional physiology defined a limited role of the horizontal fibers and reinforced the anatomical principles of vertical columnar organization in the cortex. This functional columnar organization of cortical architecture is the key principle in multiple subpial transection.

87.D. Sexual precocity is often the presenting symptom of hypothalamic hamartomas. Hypothalamic hamartomas may also cause gelastic (laughing) seizures.

88.D. Pleomorphic xanthoastrocytoma (PXA) is an astrocytic neoplasm with a relatively favorable prognosis.

89.B. Excitatory input from CA3 to CA1 pyramidal cells is carried by Schaffer collaterals. These collaterals spare the CA2 region.

90.B.

91.A. The amino acids phenylalanine and tyrosine are precursors for catecholamines (dopamine, norepinephrine, epinephrine).

92.D. The gracile and cuneate fasciculi are supplied by the posterior spinal arteries. The paired posterior spinal arteries [arising from either posterior inferior cerebellar artery (PICA) or vertebral] supply the posterior one third of the spinal cord.

93.C. Adson's test is used in the examination of thoracic outlet syndrome. In this example the examiner is checking to see if the radial pulse is obliterated. Compression of nerves causes wasting of muscles supplied by the lower trunk of the brachial plexus.

94.E. The corticobulbar tract is located in the genu of the internal capsule.

95.D. The medial forebrain bundle traverses the entire lateral hypothalamic area and interconnects the septal area and nuclei, the hypothalamus, and the midbrain tegmentum. The medulla is connected with the hypothalamus via the dorsal longitudinal fasciculus, which projects to the parasympathetic nuclei of the brainstem.

96.D. It is postulated that the closure of the lambdoid sutures, common in Crouzon's syndrome, results in cerebellar tonsillar herniation.

97.A. The most severe forms of hypothalamic cachexia are seen in lesions of the lateral hypothalamus.

98.C. Lesions of the prefrontal cortex result in failure to discriminate odors. The prefrontal cortex receives projections from the pyriform cortex. There is also a projection from the pyriform cortex to the dorsomedial thalamus to the prefrontal cortex.

99.B. Bcl-2 is an inhibitor of apoptosis similar to Ced-9 in *C. elegans*. HSP (heat shock proteins) are related to the cell's ability to withstand thermal stress.

100.D. Renal cell carcinoma has a predilection for the ventricular system.

101.A. Ireland has the highest incidence of PKU (1 in 5000). PKU is caused by a deficiency in phenylalanine hydroxylase, which has significantly reduced levels of enzyme activity. This results in abnormally high levels of phenylalanine with diminished levels of tyrosine. An accumulation of phenylalanine can result in brain damage with features including mental retardation, seizures, and aggressive tendencies.

102.B. The straight sinus is formed by the great cerebral vein of Galen and the inferior sagittal sinus.

103.D. Oscillopsia is a condition where objects seem to wiggle; it sometimes accompanies downbeat nystagmus.

104.A. Atropine only blocks muscarinic receptors, thus only preganglionic synapses are affected.

105.A. Wernicke's encephalopathy is due to deficiency of thiamine (B_1).

106.D. Gustatory fibers of the solitary nucleus terminate in the VPM, while fibers carrying thoracic information terminate in the parabrachial nucleus and hypothalamus.

107.B. In contrast to diffuse astrocytomas, anaplastic astrocytomas typically display mitotic activity.

108.D. The typical site for a cavernous hemangioma of the orbit is in the intraconal space lateral to the optic nerve.

109.C. This EKG demonstrates J-point elevation, which is associated with hypothermia.

110.E. Small arteries from the ependymal surface feed the AVM.

111.A. Under conditions of neuronal activation, dopamine β-hydroxylase is the rate-limiting step. However, under basal conditions tyrosine hydroxylase is the rate-limiting step.

112.B. The venous angle is a landmark for the foramen of Monro. It is formed by the union of the septal vein and the terminal (also called thalamostriate) vein.

113.E. Ocular bobbing is a rapid downward movement of the eyes with a slow return to midposition and has many causes.

114.E. This CT reveals dense sclerosis around a lytic lesion with a central calcified nodule in the lumbar neural arch.

115.C. The striae *medullares* (rhombencephali) arise from the arcuate nuclei of the medulla and are seen on the floor of the rhomboid fossa. These fibers divide the rhomboid fossa into a rostral pontine half and a caudal medullary half. The stria *medullaris* (thalami) contains septohabenular fibers. The stria terminalis is a semicircular fiber bundle extending from the amygdala to the hypothalamus and septal area.

116.C. No blood vessels penetrate the intervertebral disc. Delivery of nutrients is entirely dependent on diffusion.

117.D. The olivocochlear bundle arises from the region of the superior olivary nucleus and projects contralaterally back to the hair cells of the cochlea. Stimulation of this bundle results in inhibition or reduction of responses of auditory signals by auditory nerve fibers.

118.B. Pleomorphic adenomas of the lacrimal gland should be removed with a cuff of normal tissue to reduce the risk of tumor seeding and recurrence. An incisional biopsy should not be performed on this type of tumor.

119.C.

120.C.

121.B. Dopa-responsive dystonia (Segawa's syndrome) is due to a mutation in the gene encoding guanosine triphosphate (GTP)-cyclohydrolase 1, the rate-limiting enzyme in the synthesis of the biopterin cofactor of tyrosine hydroxylase. Tyrosine hydroxylase requires a biopterin cofactor and iron for proper functioning. This condition is autosomal dominant and begins in the first decade of life with a marked diurnal variation of a lower limb dystonia.

122.B. The superior cerebellar artery supplies the superior surface of the cerebellum and the cerebellar nuclei.

123.D. In the comatose patient, a lesion at the level of the vestibular nuclei results in extensor movements of the arms and weak flexor movements of the legs. Flaccidity of the lower and upper extremities occurs with lesions below the vestibular nuclei. Lesions above the red nucleus (*decorticate*) result in flexion of the upper and extension of the lower extremities. Lesions below the red nucleus (and above the vestibular nuclei) result in extensor posturing of all extremities (*decerebrate*).

124.E. Fibers of the chorda tympani reach the sphenopalatine ganglion to produce "crocodile tears," also known as Bogorad's syndrome.

125.A. With a cervical syrinx, one would expect attenuation or abolition of the cervical N13 evoked potential. N13 attenuation may be due to involvement of those laminae of the dorsal horn that receive input from large-diameter mechanoreceptor fibers.

126.C. Wolff's law states that a bone develops the structure most suited to resist the forces acting upon it. Sherrington's law: every posterior spinal nerve supplies a special region of skin. Jackson's law: the nerve functions that are latest developed are the first to be lost. Delpech's principle: in spondylolisthesis, when slippage reaches around 30% the anterior inferior part grows at a faster rate than the overloaded posterior part of the vertebral body.

127.D. Chordomas tend to be in the midline, while chondrosarcomas are more frequently found off the midline (at the petrosphenoid synchondrosis). Chordomas express S-100 only variably. Normal neurologic examinations are more common in patients with chordoma, whereas visual loss, facial numbness, and multiple cranial neuropathies are more common in patients with chondrosarcoma. These differences probably reflect the tendency of chordomas to originate from the clivus and chondrosarcomas from the temporal bone.

128.A. Thalamotomy is quite effective for medically refractory essential tremor. The patients who benefit most from thalamotomy are usually young with tremor-predominant Parkinson's disease.

129.D. Due to considerable variation in the attachment of the dentate ligament, the best estimate of the equator is the midway point of the dorsal and ventral rootlets. The equator is a useful landmark for the posterior extent of a cordotomy incision and marks the point of the sacral-most fibers of the spinothalamic tract. The exiting ventral roots are ~5 mm from the anterior spinal artery.

130.C. It usually takes 12 to 18 months for radiation changes to appear on MRI scans.

131.C. L-dopa is converted very quickly to dopamine by AADC. Dopamine is converted to NE by dopamine β-hydroxylase, which is found in vesicles within the catecholaminergic neuron.

132.B.

133.A. The length constant is the distance along a fiber where a change in the membrane potential produced by a given current decays to a value of approximately one third of its original value. It is directly proportional to membrane resistance and inversely related to axial resistance (the resistance of the cytoplasm within the fiber).

134.D. Raynaud's phenomenon is caused by mast cell dysfunction; sympathectomy has not proven helpful. Half of these patients have collagen vascular disease.

135.D. Epidural hematomas are the most common intracranial hematoma in children. Although an arterial component is of major concern, diffuse oozing from the bone or from the highly vascularized periosteal surface of the dura is now considered to be a more common source of epidural hematomas in children.

136.E. Spondylolysis is a bone defect in the posterior vertebral arch between the upper and lower articular processes, that is, the isthmus or pars interarticularis.

137.B. Winged scapula is caused by paralysis of the serratus anterior muscle as a result of damage to the long thoracic nerve that arises from the roots of the brachial plexus (C5-C7).

138.A. The typical thalamotomy target is the Vim (ventralis intermedius) nucleus. Often just inserting the electrode into Vim reduces the tremor (microthalamotomy effect), and indicates that the electrode is in good position.

139.D. All are derived from the telencephalon.

140.D.

141.C. Dopamine β-hydroxylase (DBH) is released from cells when its product, norepinephrine, is released. DBH is found in the vesicles of the catecholaminergic neurons.

142.B.

143.D. The spiral ganglion consists of bipolar neurons of the cochlear division of the vestibulocochlear nerve.

144.E. The supplementary motor area (area 6) is unique because a lesion in that location is associated with no language output, usually with complete recovery in weeks to months. This is in contrast with the perisylvian language sites.

145.A. During middle fossa approaches, this anatomy can be appreciated. As the dura is elevated, branches of the middle meningeal artery are encountered and the greater and lesser superficial petrosal nerves are identified immediately posterior to the foramen spinosum. With careful bone removal, the greater superficial petrosal nerve can be traced back to the geniculate ganglion.

146.E. The position of the posterior inferior tip of L5 characterizes spondylolisthesis (III–V being higher grades).

147.D. Golgi tendon organs detect tension in the muscle fiber. Afferent signals are carried by Ib fibers to interneurons that decrease the α motor neuron output.

148.D. The Vim is thought to be a relay nucleus for kinesthetic sensation. All observations indicate placement in the Vim. Contralateral paresthesias from stimulation of the Vim occurs at higher thresholds than those obtained from the VC nucleus (posterior to the Vim).

149.C. Glomeruli of the olfactory nerve are composed of mitral and tufted cells. Axons of mitral and tufted cells go on to form the lateral olfactory tract.

150.A. The sylvian triangle is defined angiographically by (1) the most posterior branch of the middle cerebral artery as it exits the sylvian fissure, (2) branches of superior ramifications of the MCA, and (3) inferior loops of the MCA.

151.D. MAO_A and MAO_B are associated with the outer mitochondrial membrane.

152.A. The metencephalon is a secondary vesicle that becomes the pons, cerebellum, and upper part of the fourth ventricle. The myelencephalon becomes the medulla and the lower part of the fourth ventricle.

153.A. The tectorial membrane is a projection of the spiral limbus that overlies hair cells of the organ of Corti. The basilar membrane supports the organ of Corti and separates the cochlear duct from the scala tympani. The vestibular membrane (Reissner's membrane) separates the scala vestibuli from the cochlear duct.

154.B. Solitary projections to the nucleus ambiguus are largely bilateral and are the intermediate neurons in the pathway for the gag reflex.

155.C. The film shows a grade I spondylolisthesis at L4-L5. Although management of this problem is wide ranging, the best management from the choices given is a pedicle screw fusion at the concerning levels (L4-L5).

156.B. The GABA-B receptor is activated by the GABA analogue baclofen, is not chloride dependent, and is bicuculline insensitive. GABA-C is found in the retina, hippocampus, and cerebellum, and is insensitive to baclofen and bicuculline.

157.C. Structures that pass above the tendinous ring are the lacrimal nerve, frontal nerve, and CN IV (trochlear).

158.C. The most common causative organism of brain abscesses in trauma is *Staphylococcus.*

159.B. The most common causative organism of brain abscesses in adults due to chronic otitis is *Streptococcus.*

160.A. The most common causative organisms of brain abscesses in neonates are *Citrobacter, Bacteroides, Proteus,* and gram-negative bacilli.

161.A. Tranylcypromine is an inhibitor of MAO_A. Deprenyl is a specific inhibitor of MAO_B.

162.B. The floor plate contains the ventral white commissure.

163.E. Sturge-Weber syndrome occurs sporadically without mendelian inheritance and is of unknown etiology.

164.E. There are non-choroid plexus sites of CSF production. Likewise there are sites of absorption other than the arachnoid granulations (paranasal sinuses, cervical lymphatics, exiting nerve roots, and transependymal flow).

165.C. In patients with known systemic cancer, 10 to 15% of single brain lesions are cerebral abscesses or primary brain tumors.

166.A. Vigabatrin interferes with GABA breakdown, while tiagabine interferes with GABA reuptake.

167.B.

168.B. Lesions placed too laterally during thalamotomy risk injury to the internal capsule (posterior limb). Lesions placed too posterior may cause contralateral hemisensory deficits owing to injury of the VC (ventralis caudalis) nucleus.

169.B. Cyclosporine along with some of the newer immunosuppressive agents (FK-506 or tacrolimus) work at the level of the T cell by inhibiting expression of IL-2.

170.E. The perforating arteries from the Pcom are termed the *anterior thalamoperforating* arteries. Those from the P1 are called the *posterior thalamoperforating* arteries. Those from P2 are termed the *thalamogeniculate* arteries.

171.D.

172.E. The basal plate gives rise to the hypoglossal nucleus, nucleus ambiguus, dorsal motor nucleus of the vagal nerve, and the inferior salivatory nucleus.

173.D. The clinical diagnosis of HHT is based on documentation of two of the following features: (a) recurrent epistaxis, (b) telangiectasias in areas other than the nasal mucosa, (c) autosomal-dominant inheritance, and (d) visceral involvement.

174.B. Kocher's point places the catheter in the frontal horn of the lateral ventricle. One can measure 1 cm anteriorly to the coronal suture or 3.5 cm in front of the bregma. This precaution is to avoid the motor strip. Keen's point would be used for placement of the catheter in the trigone and would require entrance through the posterior parietal region.

175.B. The MRI demonstrates absent flow voids in the left vertebral artery, a finding consistent with Wallenberg syndrome.

176.C. Clonazepam acts by increasing GABA-A opening frequency and does not have any hepatic enzyme-inducing properties.

177.A.

178.E. Freezing episodes and postural instability do not appear to be improved with pallidotomy.

179.E. It is bounded medially by the adductor longus.

180.C.

181.B. Serotonin is found in many cells that are not neurons, such as platelets, mast cells, and enterochromaffin cells. In fact, the brain accounts for only ~1% of body stores of serotonin.

182.E. The alar plate gives rise to the layers of the superior colliculus and to the nuclei of the inferior colliculus.

183.A. Sneddon's syndrome is a potentially fatal, slowly progressive, neurocutaneous disorder that affects primarily small- to medium-sized arteries. Seddon is a classification of nerve injury, and not a syndrome.

184.D. When dissecting below the arcuate line, the transversalis fascia is the only fascial layer between the rectus abdominis and the peritoneum.

185.B. Cranial neuropathies are a more common presenting sign of ependymomas than other tumors due to their tendency to arise from the floor of the fourth ventricle. Medulloblastomas typically arise from the inferior medullary velum.

186.D. Lissauer's tract caps the dorsal horns and these fibers terminate in the substantia gelatinosa (lamina II).

187.B. The limen insula is part of the primary olfactory cortex and is found at the junction of the insular and frontal lobe cortex.

188.C. If the electrode is correctly placed, visual thresholds are usually between 2 and 3 V. Higher values indicate that the electrode is too far superior. Lower values indicate that the electrode is too far inferior.

189.C. The adductor canal contains the femoral vessels, the saphenous nerve, and the nerve to the vastus medialis.

190.B.

191.B.

192.D.
193.C.
194.B.
195.A.

196.D. Enlarged pituitary stalk may be due to sarcoidosis, which can present with elevated angiotensin converting enzyme levels. It may also be due to Langerhans cell histocytosis, which may present with eosinophilic granuloma. It can occur in cases of meningitis in children. It is very rarely associated with primary pituitary tumors.

197.D.

198.D.

199.A.

200.E.

201.B.

202.E. Golgi tendon organs are sensitive to muscle tension.

203.D.

204.A. Shunt nephritis is a well-described complication of VA (ventriculoatrial) shunts. VA shunt complications are much more severe and potentially life threatening than VP shunt complications.

205.C. There is a paucity of mitoses and no necrosis in DNET.

206.D. The patient likely presents with an ACTH-secreting macroadenoma. Proper evaluation prior to surgery includes ophthalmologic and endocrine consultations and endocrine panel of laboratory tests.

207.D.

208.D. All of the information that is passed between the brainstem and the cerebellum enters and exits through one of three cerebellar peduncles: inferior cerebellar peduncle or the *restiform* body at the level of the medulla, middle cerebellar peduncle or the brachium pontis at the level of the pons, or superior cerebellar peduncle or the brachium conjunctivum at the level of the midbrain. The vestibulocerebellar tract traverses the *juxtarestiform* body.

209.C. Higher levels of TrkA are seen in neuroblastomas with favorable histology. The other factors listed are associated with worse prognosis in neuroblastomas.

210.C.

211.C. Choline acetyltransferase is the definitive marker for cholinergic neurons. Hemicholinium-3 blocks the high-affinity cholinergic reuptake process.

212.A. Tanycytes are a variety of ependymal cells found in the wall of the third ventricle. The tanycyte is a cell with intermediate features between astrocytes and ependymal cells.

213.B. The diagram shown represents the lumbar plexus: structure A is the ilioinguinal nerve, B is the genitofemoral nerve, C is the lateral femoral cutaneous nerve, D is the femoral nerve, and E is the obturator nerve.
214.D.
215.E.
216.C.

217.B.

218.B. Facial agnosia (prosopagnosia) results from bilateral damage to the medial basal occipitotemporal cortex.

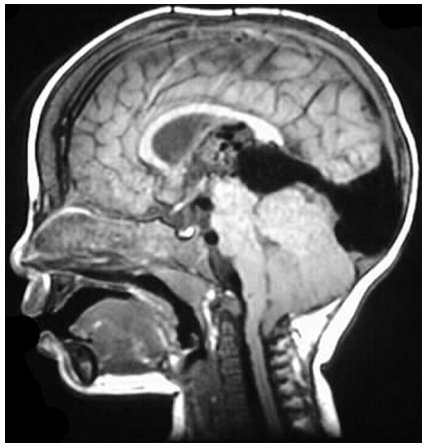
219.E. All of the above may present in children with neuroblastomas. Diarrhea is from VIP secretion by the tumor. Ondine's curse results from impaired autonomic control of respiration.

220.C.

221.D. The synthesis of NO (nitrous oxide) involves the conversion of L-arginine into NO and citrulline. All three isoforms of NOS require tetrahydrobiopterin as a cofactor and NADPH as a coenzyme.

222.B. The substantia gelatinosa (Rexed lamina II) is found at all cord levels and is homologous to the spinal trigeminal tract. It is associated with light touch, pain, and temperature sensation and it integrates input for the ventral and lateral spinothalamic tracts.

223.A. Vein of Galen malformation (VOGM) may be defined as a direct AV fistula between choroidal and/or quadrigeminal arteries and an overlying single median venous sac; it is rare, representing only less than 1% of all intracranial AVMs. Neonatal patients present with an abrupt onset of high-output cardiac failure; as much as 80% of the cardiac output may pass through the fistula. An audible bruit may be present.



224.D. The scan demonstrates an intramedullary cavernoma. These lesions tend to bleed in patients of young age, show a clear sensory level, present with subarachnoid hemorrhage or by progressive ascending paraplegic syndrome. The definitive therapy is microsurgical elimination.

225.B.

226.D.

227.B.

228.D. Delta waves occur with deep sleep, infancy, and brain disease.

229.E. The stylohyoid is innervated by VII. The styloglossus is innervated by XII. The stylopharyngeus is innervated by IX.

230.E. Hyperbaric oxygen treatment is an alternative to standard surgical removal of infected bone flaps.

231.A. Allodynia is a condition in which a painful response is produced by an innocuous mechanical stimulation. It is the result of sensitization of spinothalamic neurons in the dorsal horn and the failure of descending systems to control the activity of these neurons. Alloesthesia is characterized by a painful stimulus on one side of the body that is thought to be on the other side.

232.D. Clarke's nucleus is found at the base of the dorsal horn and corresponds to Rexed VII lamina. Clarke's column extends from C8 or T1 to about L3. Clarke's nucleus is homologous to the accessory cuneate nucleus of the medulla. It subserves unconscious proprioception from the muscle spindles and Golgi tendon organs and is the origin of the dorsal spinocerebellar tract.

233.E. Basal encephaloceles should be treated as early as possible. Children with basal encephaloceles in the nasopharynx are at significant risk of developing meningitis.

234.B. The anterior limb of the internal capsule (on horizontal section) can be found between the caudate nucleus and the corpus striatum (globus pallidus and putamen). Clinically important tracts lie in the genu and posterior limb. The posterior limb (on horizontal section) can be found between the thalamus and the corpus striatum (globus pallidus and putamen). The posterior limb of the internal capsule contains corticospinal fibers.

235.D.
236.A.
237.B.
238.C.

239.D. The greater occipital nerve is a sensory nerve from the dorsal ramus of C2.

240.C. Thromboxane synthesis inhibitors lead to a buildup of arachidonic acid.

241.C. The lateral portion of the substantia nigra pars reticulata (SNpr) is connected with cortical and brainstem areas that control eye movements. SNpr is GABAergic and inhibitory to the VLm (medial part of the ventrolateral thalamus) and VAmc (magnocellular part of the ventral anterior thalamus).

242.A. The dorsal lateral sulcus receives the dorsal roots.

243.D. The scan shows a diffusely enhancing brainstem glioma. Biopsy is usually not recommended in this case. Hyperfractionated radiation therapy has been shown to improve survival. Brainstem glioma represent 10 to 20% of childhood CNS tumors. There are currently no proven chemotherapeutic regimens.

244.A.
245.C.
246.B.
247.B.

248.B. Lhermitte-Duclos disease is an uncommon cerebellar dysplasia that is characterized by hypertrophy of granular-cell neurons, and axonal hypermyelination in the molecular layer. Also known as dysplastic gangliocytoma of the cerebellum, it may occur in the setting of Cowden disease caused by a *PTEN* germline mutation.

249.A. There is no sensory deficit and no decrease in corneal reflex. There are no other symptoms in the other cranial nerves.

250.B. The liquid embolic agent n-butylcyanoacrylate is used in interventional neuroradiology. The embolic agents that are particulate in nature include polyvinyl alcohol (PVA), platinum coils, and silk thread.

251.C. The GCS in this case would be 13. Eye open to speech (3), the patient is confused (4), and he obeys motor commands (6).

252.B. The ciliospinal center of Budge is found in the lateral horn at T1. This is a sympathetic nucleus that innervates the radial muscle of the iris (dilator pupillae) and the nonstriated superior and inferior (Müller) muscles.

253.E. Aspirin decreases all anticonvulsant levels.

254.A. Posterior inferior cerebellar artery (PICA) syndrome causes decreased contralateral pain and temperature of the body.

255.C. Teardrop fractures occur when a fracture occurs on the anteroinferior edge of the vertebral body. The injury is due to hyperflexion and is unstable. Teardrop fractures are associated with anterior cord syndrome.

256.A. ITP is immune mediated, not related to an exogenous cause, and treatment of ITP is with steroids and splenectomy. TTP is nonimmune mediated and most often occurs in young females.

257.B. Dura and blood vessels are formed from mesoderm.

258.C. The most common primary septal tumor is astrocytoma.

259.C. The superior cerebellar artery is the most commonly conflicting artery in trigeminal neuralgia.

260.A. The ELANA technique (excimer LASER-assisted nonocclusive anastomosis) may be used to anastomose arteries.

261.B. This MRI demonstrates a unilateral jumped facet with rotation in the cervical cord, compromising the spinal canal.

262.D. This particular AVM is best graded 4A. Its medium size (2), eloquent location (1), and deep drainage (1) place it as a Spetzler-Martin grade 4. The fact that it has stenotic venous drainage gives it a subclassification of 4A.

263.B. Biot (irregular) breathing is caused by a lesion in the dorsomedial medulla.

264.B. The anterior choroidal artery supplies the internal globus pallidus, posterior limb of the internal capsule, and temporal horn of the choroid plexus.

265.D. Pronator teres syndrome is different from carpal tunnel syndrome in that patients with pronator teres syndrome exhibit numbness in the palm and nocturnal exacerbations are rare.

266.C. Factor XIII deficiency exhibits normal bleeding parameters.

267.C. The area postrema is the only paired circumventricular organ.

268.B. Sweet and bitter tastes activate receptors coupled to G-proteins.

269.B. Although it is true that the pain starts at V_2 (the lower side of the nose) and then involves V_3 and V_1, it is only necessary to treat the trigger zone.

270.E. Gerstmann's syndrome is caused by a dominant parietal lobe lesion. Astereognosis is also caused by an anterior parietal lobe lesion, but is not part of Gerstmann's syndrome.

271.E. Epidermoids of the skull show a lytic defect with a scalloped, sclerotic rim. They are slow growing and rarely show malignant transformation.

272.E.

273.B. Nightmares occur during REM sleep; night terrors may occur in either stage 3 or 4 sleep. Stage 4 sleep is associated with delta waves.

274.E. Risk of hemorrhage from coumadin is increased with phenobarbital, carbamazepine, cephalosporins, sulfas, penicillin, and alcohol.

275.D.

276.B. A high-riding jugular bulb may be encountered during the drilling portion and should be tamponaded with hemostatic products and cottonoids.

277.B. The subcommissural organ is the only circumventricular organ with an intact BBB.

278.B. Dysgeusias are particularly prevalent in the elderly, and are often associated with the use of antihypertensives (e.g., captopril).

279.C. Gamma knife treatment is the best mode of therapy for an AVM that is smaller than 3 cm and located in an eloquent area. The angiogram shows a small subcortical right parietal AVM with a filling vessel arising from a branch of the right middle cerebral artery. Venous drainage is noted into the upper sagittal sinus.

280.D. Foster-Kennedy syndrome is usually caused from an olfactory groove or medial-third sphenoid wing tumor (usually meningioma). The classic triad is anosmia (ipsilateral), central scotoma (ipsilateral), and papilledema (contralateral).

281.B. Pick's disease is characterized by severe focal atrophy commonly in the frontal and temporal lobes. This results in mental status and personality changes occurring in Pick's disease patients. Pick bodies are positive for *tau* protein.

282.B. Fibrillation potentials are triphasic, last 1 to 5 milliseconds, and are caused by the activity of one fiber.

283.B. Sleep spindles (the burst described) and K complexes (sharp slow waves of high amplitude) are characteristic of stage 2 sleep.

284.D. This bony promontory seen in the picture is the posterior clinoid process and may be drilled carefully to expose the neck of the aneurysm.

285.D. The suprascapular nerve is trapped in the suprascapular notch. This nerve is the branch of the superior trunk. Atrophy of the supraspinatus and infraspinatus can result.

286.C. The abducens nerve crosses the medial lemniscus on exiting the brainstem.

287.B. The correct units are 50 mL/100 g/min.

288.D.

289.A. The most significant improvement noted postoperatively in the removal of frontal meningiomas involves attentional functions. There are no differences in memory, visuoconstructive abilities, or executive functions.

290.B. PML (progressive multifocal leukoencephalopathy) is caused by infection with group B human papovaviruses, principally JC virus. PML is typically bilateral, asymmetric, and most commonly involves the posterior centrum semiovale.

291.C. The substantia nigra pars reticulata neurons related to saccadic eye movements decrease their activity during the saccade.

292.D.

293.A. Research with model systems of seemingly disparate species (i.e., marine snail and the albino rat) suggest that neural mechanisms involved in associative learning may be highly conserved across species.

294.E.

295.C. Hypothermia is characterized by J-point elevation.

296.A. Anterior encephaloceles are compatible with normal intelligence in the majority of patients. Atretic encephaloceles also appear not to influence intellectual development and also have a lower incidence of hydrocephalus.

297.A. Giant cell glioblastoma is shown in the slide. The hallmark of giant cell glioblastoma is predominance on multinucleated giant cells and a high frequency of the TP53 mutation.

298.D. These features should not necessarily prompt the diagnosis of glioblastoma.

299.B. The supramarginal gyrus is at the posterior reach of the sylvian fissure.

300.A. Avellis' syndrome is caused by a brainstem lesion that limits vagal innervation unilaterally, resulting in ipsilateral paralysis of the vocal cord and soft palate and loss of sensitivity to pain and temperature in the contralateral leg, trunk, arm, and neck. This syndrome is also called ambiguospinothalamic paralysis.

301.E. Bicuculline is a GABA-A antagonist. Muscimol is a GABA-A agonist. Kynurenate is a glutamate antagonist. Picrotoxin is a GABA inhibitor.

302.B. There is increased production of PMP22 in CMT disease.

303.C. Neurons in the spinal nucleus and in the ventral part of the chief sensory nucleus give rise to the crossed ventral trigeminothalamic tract.

304.D. In stroboscopic illumination at flicker rates below 15 Hz, the motion system is disabled. This explains why nightclub dancers are seen as moving discontinuously under a strobe light.

305.C. The tectospinal tract decussates in the dorsal tegmental decussation. Tectospinal fibers originate from deeper layers of the superior colliculus and distribute to cervical cord levels. Rubrospinal fibers decussate in the ventral tegmental decussation.

306.A. In the Royal Melbourne Hospital series of paranasal sinus cancers treated by craniofacial resection, sphenoid sinus involvement was the major predictor of later tumor recurrence.

307.E. Bipolar cells serve as interneurons between photoreceptor cells and ganglion cells.

308.D.

309.B.

310.C. The connatal form (type II) is clinically more severe and symptoms begin in the neonatal period. PMD results from mutations affecting the gene for proteolipid protein (PLP).

311.D. The pontocerebellar tract passes to the cerebellum via the middle cerebellar peduncle. The ventral spinocerebellar tract and the tectocerebellar tract pass through the superior cerebellar peduncle.

312.C. The lateral zone (dentate) send fibers to the VL thalamus and motor cortex (area 4). A lesion of the anterior lobe may cause slight hyperreflexia.

313.A. Dendrodendritic synapses have been found in the olfactory bulb and have been shown to be inhibitory; the granule cell processes make synaptic contacts with dendrites of mitral cells. Axodendritic synapses are excitatory. Axosomatic synapses are inhibitory and a classic example is the cerebellar basket cell contacting the Purkinje cell.

314.B. The parvocellular system of the dorsal lateral geniculate nucleus makes up ~80% of the total ganglion cell number.

315.E. During a neurosurgical procedure, a sudden decrease in end tidal CO_2 suggests venous air embolus, and may even precede the appreciation of changes by the precordial Doppler.

316.E. These structures run in the floor of the body of the lateral ventricle.

317.A. The contents of the cubital fossa from medial to lateral are the median nerve, brachial artery, biceps brachii tendon, and the radial nerve.

318.D. The teres minor rotates the arm laterally.

319.C. The internal cerebral vein position can be confirmed by superimposing the angiogram of the medial posterior choroidal artery with the venous phase. The internal cerebral vein and the medial posterior choroidal artery occupy the same position when the arterial and venous phases are superimposed. Both of these structures course within the cistern of the velum interpositum.

320.B.

321.D. The Botzinger complex is the principal source of reciprocal inhibition in the respiratory network. It is composed of a cluster of cells at the rostral-most tip of the ventral respiratory group.

322.D. The posterior cord gives rise to the upper subscapular, lower subscapular, and thoracodorsal nerves. The latissimus dorsi is innervated by the thoracodorsal nerve. The subscapularis muscle is innervated by the upper and lower subscapular nerve. The teres major is innervated by the lower subscapular nerve.

323.A. The vast majority of children present with ischemic symptoms (TIAs, extremity weakness), whereas adults typically present with hemorrhage.

324.C. Valproic acid has a short half-life (~8 hours). Association with platelet dysfunction should alert the surgeon to the possibility of bleeding problems, especially in epilepsy cases.

325.B. Isoflurane allows patients to emerge from anesthesia faster and there is less hepatic effect from this agent. In addition, isoflurane produces the least increase in cerebral blood flow (CBF) of inhalational anesthetics.

326.C. The glomus is a prominent tuft of choroid plexus found in the atrium.

327.C. The axillary nerve passes posteriorly around the surgical neck of the humerus. The radial nerve lies in the radial groove of the middle of the shaft of the humerus. The ulnar nerve passes behind the medial epicondyle. All three of these nerves are susceptible to humerus fractures because they lie in close contact with bone.

328.C. The premotor area plays a role in programming and sequencing learned complex movements.

329.E.

330.A. Theta activity has a frequency of 4 to 7 Hz. Other common EEG rhythms are delta (0–3 Hz), α (8–13 Hz), and β (>13 Hz).

331.B. The mesencephalic nucleus of the trigeminal nerve has pseudounipolar neurons. The mesencephalic nucleus extends from the pons to the upper midbrain. It receives input from muscle spindles and pressure receptors.

332.B. These second-order neurons give rise to axons that enter the cerebellum via the superior cerebellar peduncle. The ventral spinocerebellar tract conveys efference copies of motor commands for the lower extremities.

333.E. Narcolepsy is associated with HLA-DR2. HLA-B40 (children), HLA-B54 (adults), and HLA-A24 (both children and adults) are associated with moyamoya syndrome. HLA-B27 is associated with ankylosing spondylitis; of patients with ankylosing spondylitis, over 80% are HLA-B27 positive. However, this cannot be the only factor involved because only 2% of HLA-B27 positive individuals develop ankylosing spondylitis.

334.D. Awad et al. have demonstrated that the extent of mesiobasal resection determines the outcome after temporal lobectomy for intractable complex partial seizures.

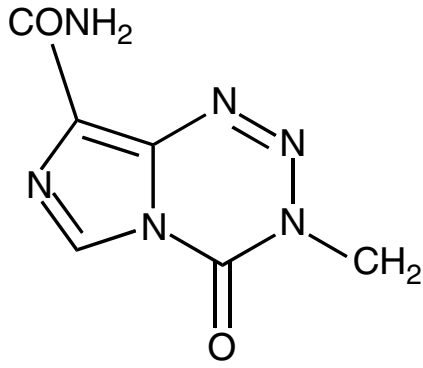
335.E. Sydenham's chorea is the most common cause of chorea. Also known as St. Vitus' dance, this chorea occurs mainly in young females after a bout of rheumatic fever.

336.D. Decadron is shown in the picture. A postoperative course of an H_2-receptor blocker is indicated for patients on glucocorticoid treatment.

337.D.

338.B. Vim stimulation is the procedure of choice when contralateral thalamotomy has been performed or is anticipated.

339.C. Temozolomide (TMZ) is an orally administered chemotherapeutic (alkylating) agent with minimal side effects that readily crosses the blood–brain barrier and is approved for treating anaplastic astrocytomas.



340.D. The H-reflex is a submaximal stimulation of mixed motor-sensory nerves, not enough to cause a direct motor response. The H-reflex is the electrical representation of the tendon reflex circuit.

341.B. The most common and pronounced aging effect on the brain is cell loss.

342.A. Stereognosis is an important function of the dorsal-column-medial lemniscal system.

343.C. Irrigation of fluid-coupled monitoring systems increases the infection rate nearly threefold. Thus irrigation should be performed infrequently and with exquisite sterile technique.

344.E. Area 4 fibers terminate in laminae VI–IX, whereas the postcentral gyrus fibers end mainly in laminae IV and V. The anterior corticospinal tract is an uncrossed tract in the (medial) ventral cord and terminates on lamina VII.

345.E. The paracentral lobule is supplied by branches from the anterior cerebral artery.

346.D.

347.D.

348.D. The sensorimotor GPi is located in the posterolateral part of the nucleus.

349.A. The lesion represents a nerve root schwannoma. The majority of these arise from a dorsal nerve root. Ten to 15% extend through the dural root sleeve. The fourth through sixth decades represent the peak incidence of occurrence. Schwannomas are typically described as smooth globoid, and do not produce enlargement of the nerve but are suspended eccentrically from it with a discrete attachment.

350.D.

351.C. Cowdry type A inclusions are intranuclear and are seen with cytomegalovirus (CMV), herpes, and subacute sclerosing panencephalitis (SSPE). Cowdry type B inclusions are intranuclear and are seen in acute poliovirus. The others listed are intracytoplasmic inclusions. Lafora bodies are seen in myoclonic epilepsy. Bunina bodies are seen in amyotrophic lateral sclerosis (ALS).

352.D. The dorsal spinocerebellar is an uncrossed tract.

353.D. Nystagmus in Meniere's disease is horizontal and contralateral to the affected side. Past-pointing and falling occur toward the affected side.

354.A. The pulvinar has reciprocal connections with the inferior parietal lobule.

355.E.

356.B. Pineal tumors usually lie between the precentral cerebellar vein and the vein of Galen. The precentral cerebellar vein is usually displaced posterosuperiorly. This vein may be sacrificed if necessary.

357.C. The pharyngeal tubercle is found in line with the vomer and foramen magnum at the cranial base.

358.D. The anterior choroidal and lateral posterior choroidal supply the lateral ventricle. The medial posterior choroidal supplies the choroid plexus of the third ventricle. The posterior inferior cerebellar artery (PICA) supplies the choroid plexus of the fourth ventricle.

359.A. The final common pathway for platelet aggregation involves the binding of fibrinogen to the activated glycoprotein IIb/IIIa receptor on the platelet membrane.

360.D. Wilson's disease (hepatolenticular degeneration) is a familial metabolic disease transmitted as an autosomal recessive trait. The abnormal gene has been assigned to the esterase D locus on chromosome 13.

361.B. Bergmann glia have cell bodies located in the Purkinje layer of the cerebellar cortex.

362.E. This is a lower motor neuron lesion and Babinski's sign would not be expected.

363.C. The static labyrinth consists of the utricle and saccule. The vestibule is a central cavity of the inner ear that contains the saccule and utricle.

364.D. The ventral posteromedial (VPM) nucleus receives taste input via the ipsilateral central tegmental tract. The VPM nucleus receives sensory input from the head and oral cavity.

365.A. The lateral suboccipital retrosigmoid approach is best used for lateral tentorial notch meningiomas that extend infratentorially.

366.A. Calcifications are likely to be abnormal if encountered in children younger than 6 years. The incidence of pineal calcification is at most 40% by the age of 18.

367.E. The anterior longitudinal ligament attaches to the anterior tubercle of the atlas. The transverse ligament of the atlas is posterior to the dens. The apical and alar ligaments attach the dens to the foramen magnum.

368.B. The most frequent site of subependymoma is the fourth ventricle (50–60% of cases), followed by the lateral ventricles (30–40%). Less common sites are the third ventricle and septum pellucidum.

369.A. The lamina terminalis fills the interval between the anterior commissure and the optic chiasm.

370.A. Damage to the right frontal eye field (area 8) results in deviation of the eyes to the right.

371.D. Choroid plexus papillomas frequently display immunopositivity for transthyretin (prealbumin) and S-100.

372.B. Between 15 and 20 mL/100 g/min cortical evoked responses are lost and the EEG becomes isoelectric, but the neurons remain viable and are described as "idling." At ~30 mL/100 g/min, the patient loses consciousness.

373.C. The lateral vestibulospinal tract is an uncrossed tract.

374.E. Lesions of the mediodorsal nucleus are found in patients with the Korsakoff amnestic state.

375.B. The trochlear nerve should be identified before transecting the tentorium.

376.C. Germinomas commonly occur in males in the first three decades.

377.D. Pathologically, CNS sarcoid is characterized by noncaseating granulomas.

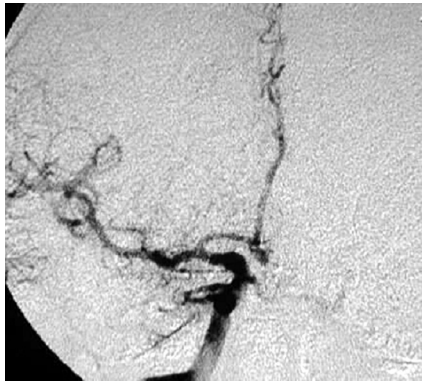
378.A. Although other tumors may be more common after 1 year of life, choroid plexus tumors are the most common tumor in the first year of life.

379.B. "Square" ACA shift is usually caused by a holotemporal mass.

380.D.

381.A. The obex is the caudal apex of the rhomboid fossa and marks the beginning of the "open medulla."

382.B. Hyponatremia (Na <130) can occur in up to 30% of ruptured anterior communicating artery aneurysms due to the local proximity of key perforators that supply the anterior hypothalamic nuclei.



383.C.

384.E. The optic disk (optic papilla) is located 3.5 mm nasal to the fovea centralis. It contains unmyelinated axons from the ganglion cell layer of the retina. The optic disk is the blind spot (contains neither rods nor cones).

385.C. The inferior obliquus capitis muscle forms a common border of the superior and inferior suboccipital triangles. The lateral borders of both triangles meet at the transverse process of the atlas, which is located 1 cm below the mastoid tip.

386.C.

387.C. Plain film calcification is rarely seen. Calcospheres are also known as psammoma bodies.

388.E. The infraspinatus is innervated by the suprascapular nerve, which originates from the upper trunk of the brachial plexus. The subscapularis is innervated by the upper and lower subscapular nerves. The teres major is innervated by the lower subscapular nerve. The latissimus dorsi is innervated by the thoracodorsal nerve. The teres minor is innervated by the axillary nerve.

389.C. The time of development of effects of radiation is dose independent.

390.E.

391.E. Amplification of epidermal growth factor (EGF) occurs in glioblastoma. Double minutes (cytogenetic evidence of gene amplification) of *N-myc* occurs in medulloblastoma.

392.A. The Goldman cardiovascular risk score for noncardiac surgery indicates that a recent MI is a contraindication to elective surgery.

393.C. The fastigiovestibular tract is an efferent pathway that passes through the superior cerebellar peduncle (SCP) (uncinate fasciculus of the SCP). The juxtarestiform body is a component of the inferior cerebellar peduncle and contains afferent (vestibulocerebellar) and efferent (cerebellovestibular) fibers.

394.B. Bilateral destruction of both cunei results in a lower altitudinal hemianopia.

395.E. A posterior communicating artery aneurysm is prone to rupture with retraction on the temporal lobe.

396.B. Wave 5 is an indication of auditory nerve activity central to the tumor. It is easier to detect than the other waves. Wave 5 is generated in the brainstem. When used with N1 (monitors action potential of the auditory nerve), it is useful for predicting postoperative hearing function.

397.D. The most common symptom at initial presentation is referable to sensation.

398.E. The dorsomedial thalamus is a part of the basolateral circuit. The basolateral circuit passes from the orbitofrontal cortex to the anterior temporal cortex via the uncinate fasciculus, then to the amygdala and the dorsomedial nucleus of the thalamus, and back to the orbitofrontal cortex via a thalamofrontal radiation. The circuit of Papez passes from the septal region via the cingulate bundle to the hippocampus, then via the fornix to the mamillary bodies via the mamillothalamic tract to the anterior thalamus, then from the anterior thalamus back to the cingulum.

399.C. Lars Leksell is called the father of modern day radiosurgery.

400.E. Broca's aphasia results from damage to Brodmann area 44 (inferior frontal gyrus).

401.B. Canavan's disease is associated with a point mutation of aspartoacyclase leading to elevated levels of NAA.

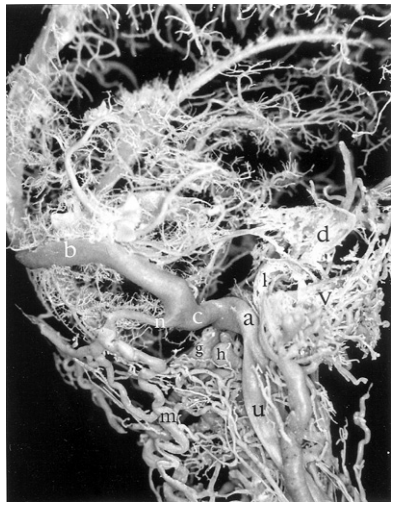
402.C.

403.A. Poxvirus is a DNA virus. Viral meningitis occurs in up to 50% of paramyxovirus infections (mumps). Rabies (rhabdovirus) targets the limbic tissue. DNA viruses cause SSPE, PML (papovavirus), and herpes encephalitis. RNA viruses are implicated in meningitis and AIDS. Herpes simplex encephalitis is the only CNS viral infection whose course and outcome are improved by specific antiviral therapy (acyclovir).

404.D. Hematoporphyrin derivative is an agent that is capable of photosensitizing malignant tumor cells. Other photosensitizers include rhodamine, acridine orange, phthalocyanines, and pyrilium derivatives.

405.B. The most sensitive cranial nerve to radiation is the optic nerve and the chiasm, with a single fraction dose tolerance of 8 Gy.

406.A. The junction of the transverse and sigmoid sinuses is usually located 1 to 1.5 cm rostral to the mastoid emissary vein. In this photograph (reprinted with permission from The American Society of Neuroradiology) the mastoid emissary vein is labeled *n*, the transverse sinus is labeled *b*, and the sigmoid sinus is labeled *c*.



407.B.

408.D. Cerebellar glomeruli are synaptic connections that contain axons of incoming mossy fibers, axons and dendrites of Golgi type II cells, and dendrites of granule cells. Purkinje cells are not part of the glomerulus.

409.E. Focal white matter necrosis is the most common histologic evidence of radiation-related CNS injury.

410.D.

411.B. Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) leads to subcortical ischemic damage, myelin loss, lacunar infarcts, and gliosis.

412.C. Exacerbation of peptic ulcer is the most common side effect of high-dose dexamethasone.

413.A. Headache is almost universally noted in patients with cryptococcal meningitis. Poor prognosis of cryptococcal meningitis is seen with positive India ink stain, low cerebrospinal fluid (CSF) leukocyte count, a positive blood culture, the presence of *C. neoformans* at extraneural sites, high CSF cryptococcal antigen titers, CSF hypoglycorrhachia, and an increased CSF opening pressure.

414.E. Because over 85% of CSF leaks from basilar skull fractures resolve spontaneously, the primary approach is expectant observation. Prophylactic antibiotics have not been shown to decrease the risk of meningitis and are not recommended.

415.C. A pituitary tumor that secretes thyroid-stimulating hormone (TSH) also frequently co-secretes the glycoprotein hormone α-subunit. An α-subunit/TSH ratio of >1 favors the diagnosis of TSH-secreting adenoma.

416.A. The superior (anterior) semicircular canal is identified by the arcuate eminence at the base of the skull.

417.D. The inferior orbital fissure is formed by the orbital surface of the greater wing of the sphenoid and the orbital surface of the maxilla.

418.A. Many spinocerebellar fibers are distributed to the medial vermal region of the anterior lobe of the cerebellum.

419.E. Aneurysms are not indications for radiosurgery.

420.C. The lesion is an epidermoid of the cerebellopontine angle. Epidermoids usually present in 20- to 40-year-olds. Unlike dermoids, they are not associated with midline defect. Spilling of their contents may cause a chemical meningitis or ventriculitis and therefore one needs to avoid spillage of tumor contents in the subarachnoid space. The main goal of therapy is complete excision of the tumor wall and contents to prevent recurrences. Radiation or chemotherapy has no role in the management. Steroids have been shown to be effective in preventing the inflammatory response and possible ventriculitis associated with these tumors.

421.B. Adrenoleukodystrophy displays X-linked recessive inheritance.

422.D. In cerebral salt wasting syndrome, there is inappropriate natriuresis and diuresis.

423.D. The presenting neurologic symptoms and signs in HIV-infected individuals with *Toxoplasma* encephalitis are focal in nature. Hemiparesis is the most common focal finding.

424.D. The fracture that initiates the leptomeningeal cyst may not be clinically evident, but most commonly involves the parietal bone.

425.C. Octreotide is fairly well tolerated; however, gallstone formation can develop in 10 to 20% of patients and is related to the inhibitory effect of octreotide on gallbladder motility.

426.D.

427.A.

428.E. The fetal Pcom is the most frequent of the persistent fetal circulations.

429.D. Angiography has no role in the management of acoustic tumor.

430.D. Interruption of Meyer's loop fibers in the temporal lobe results in the "pie in the sky" lesion.

431.C.

432.C.

433.A. If a motor task is performed repeatedly to mastery, there is progressive attenuation of the cerebellar and premotor areas, with no change of activity of the primary motor cortex.

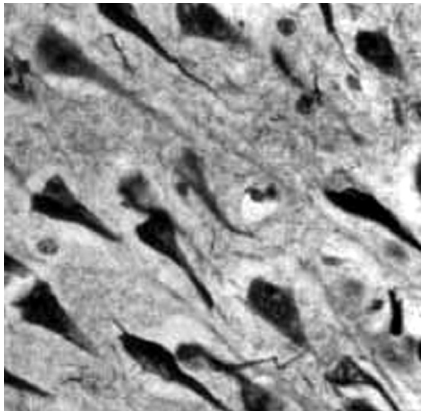
434.B. The classic lucid interval is only seen in one third of patients. Traction on the greater superficial petrosal nerve may occur with traction on the floor of the middle fossa. This may result in a dry eye postoperatively.

435.D. All are indications for craniotomy.

436.C. An ABI (auditory brainstem implant) is designed to stimulate auditory neurons of the cochlear nucleus and is placed in the lateral recess of the fourth ventricle at the time of acoustic tumor removal.

437.A.

438.E. All are associated with neurofibrillary tangles. Neurofibrillary tangles are the results of defective assembly of microtubules and/or neurofilaments.



439.E. Gyrus rectus may be removed (medial to olfactory nerve) to gain better visualization before clipping of an anterior communicating artery aneurysm.

440.C. At the optic strut, the ophthalmic artery pierces the dura to enter the orbit. After the origin of the ophthalmic, the internal carotid artery (ICA) passes the tip of the anterior clinoid process.

441.D.

442.B. The size of the hematoma is inversely related to the chance of the patient developing vasospasm. This reflects the fact that most of the blood has gone into the brain rather than the subarachnoid space.

443.A. Volatile anesthetics produce a dose-related reduction in CMR and a simultaneous increase in CBF. Intravenous anesthetic agents (except ketamine) decrease CMR and CBF in parallel. Volatile anesthetic agents increase CSF production.

444.E. The median sensory response, mediated by upper trunk fibers, would remain normal in lower trunk plexopathy.

445.D. An abnormal skin histamine response is a characteristic feature of patients with familial dysautonomia.

446.C. The jugular foramen transmits several vital structures from the posterior fossa to the neck. This foramen is situated at the junction of the temporal and occipital bone. It is the site for glomus jugulare tumors, schwannomas, and meningiomas. Glomus tumors produce local bony destruction, whereas schwannomas produce a smooth-edged enlargement of the foramen.

447.B.

448.B.

449.D. The lesion is a cavernous sinus meningioma.

450.C. The anterior inferior cerebellar artery loops around the cranial nerves VII and VIII.

451.D. The facial colliculus is located in the pontine half of the rhomboid fossa. The tuberculum cinereum (not to be confused with the "tuber cinereum" of the hypothalamus) is a surface eminence of the medulla that overlies the spinal trigeminal tract and nucleus.

452.C. Hemosiderin-laden macrophages are always seen with cavernous malformation.

453.C. Calcium channel blocking agents can be expected to have a beneficial effect in the patient; however, there is no effect on angiographic vasospasm and no increase in CBF.

454.D. The top of the cranial loop is the choroidal point, located in the telovelotonsillar segment of the PICA. The plexal point is the point where the anterior choroidal artery enters the choroidal fissure.

455.B. The principal anatomical substrate of perceptual organization is the posterior right hemisphere. Posterior right hemisphere disease tends to produce the most severe deficits of constructional praxis.

456.A.

457.B.

458.D. These tumors are rare, but must enter into the differential diagnosis of a solid third ventricle enhancing mass that is GFAP positive.

459.C. Impending herniation regardless of the tumor size or number is an indication for immediate (open) surgery.

460.B.

461.E.

462.B.

463.A.

464.C. The recurrent artery of Heubner enters the anterior perforating substance and supplies the head of the caudate, anterior limb of the internal capsule, the anterior putamen and globus pallidus (GP), the septal nuclei, and the inferior frontal lobe.

465.C. The external sphincter is composed of circularly arranged striated muscle fibers that are mostly type I (slow twitch).

466.D. Harris's method is the most clinically useful means of assessing atlantooccipital dislocation. The basion should lie within 12 mm of the superior continuation of a line drawn along the posterior cortex of the body of the axis; the distance of the basion and tip of the odontoid is normally less than 12 mm.

467.C. There are many more sodium channels located at the axon hillock.

468.B. Ganglioglioma is twice as common as DNET in causing temporal lobe epilepsy.

469.E. Huntington's chorea is not an indication for radiosurgery.

470.E. There is a tendency for the posterior insula to drain more frequently into the deep system, whereas the anterior portion of the insula drains to the superficial venous system.

471.D. The primary fissure separates the anterior cerebellar lobe from the posterior cerebellar lobe. The horizontal fissure is located within the posterior lobe. The dorsolateral fissure is synonymous with the posterolateral fissure and separates the flocculonodular lobe from the posterior lobe.

472.E. Dural AV fistulas have a male predominance, are acquired lesions, have low flow, rarely hemorrhage, and have a gradual onset of symptoms.

473.B. Neurons in the penumbra (8 to 23 mL/100 g/min) survive but do not function. Below 8 mL/100 g/min neurons cannot recover.

474.C. The zona incerta is the gray matter between the thalamic and lenticular fasciculi. Laterally, the zona incerta is continuous with the thalamic reticular nucleus.

475.D. Evidence for these areas influencing micturition comes from positron emission tomography (PET) scanning.

476.C.

477.C.

478.B. In a caudalis dorsal root entry zone (DREZ) operation, the electrode penetrates the dorsal spinocerebellar tract into the trigeminal tract and deeper caudalis nucleus.

479.C. The arterial dicrotic notch corresponds to the area between the tidal (P2) and dicrotic (P3) peaks of the ICP waveform.

480.A. The basal vein of Rosenthal receives tributaries from the medial temporal lobe and brain stem. It begins at the anterior perforated substance.

481.C.

482.D. Decussation of the superior cerebellar peduncles occurs in the caudal midbrain tegmentum at the level of the inferior colliculus.

483.B. Ascending pharyngeal artery supplies these nerves before anastomosing with vertebral artery branches.

484.B. Destruction of the abducent nucleus (subcortical center for lateral gaze) results in an ipsilateral lateral rectus and contralateral medial rectus palsy on attempted lateral gaze.

485.B.

486.D. The lateral subnucleus of CN III innervates the inferior rectus, inferior oblique, and the medial rectus. The medial subnucleus innervates the contralateral superior rectus. The central subnucleus innervates the levator palpebrae superioris.

487.C.

488.B. Pain is more common in cauda equina lesions than in conus lesions. Motor loss is more marked in cauda lesions, and bladder and rectum are involved later in cauda lesions. The onset of cauda lesions is more gradual than conus lesions. Also, cauda lesions are more commonly unilateral than conus lesions.

489.C.

490.D. The superior ophthalmic vein courses into the anterior cavernous sinus above the sixth nerve and below the first division of the trigeminal nerve. The superior ophthalmic vein is exterior to the annulus of Zinn.

491.E. The caudate nucleus forms the lateral wall of the frontal horn, body, and trigone of the lateral ventricle. It forms the roof of the temporal horn. The caudate does not extend to the occipital horn.

492.E. The dorsal trigeminothalamic tract is the rostral equivalent of the dorsal-column medial-lemniscal system.

493.D. The loose areolar tissue contains the valveless emissary veins.

494.A. Apocrine sweat glands of the axilla are innervated by adrenergic fibers, and secrete in response to mental stress. The eccrine sweat glands have cholinergic innervation.

495.B. The water content of the nucleus pulposus is maximum at birth and declines throughout life, the greatest decline occurring during the growth phase in childhood.

496.C. The tapeta are corpus callosum fibers connecting the temporal and occipital lobes.

497.D.

498.C. Cerebrospinal fluid is reabsorbed into the bloodstream through pressure-sensitive one-way valves in the arachnoid villi.

499.D. Pro opio melanocortin (POMC) gives rise to ACTH and beta-lipotropin. ACTH gives rise to α-MSH and CLIP. Beta-lipotropin gives rise to β-endorphin and gamma-lipotropin.

500.E. Late-onset myasthenia gravis (onset after age 50) is more common in males. Early-onset myasthenia gravis (onset from ages 18 to 50) is more common in females.

501.D. The ICA enters the cranium via the carotid canal of the temporal bone.

502.E. Damage to the trochlear nucleus results in damage to the contralateral superior oblique because the fibers decussate in the superior medullary velum.

503.A. The asterion is located at the intersection of the lambdoid, occipitomastoid, and parietomastoid sutures. This point reliably marks the anteroposterior level of the transverse-sigmoid sinus junction.

504.D. The anterior nucleus of the hypothalamus is involved in thermal regulation (dissipation of heat). The anterior nucleus stimulates the parasympathetic nervous system. Destruction of this nucleus results in hyperthermia.

505.D. Discs make up roughly 25% of the spine's height. There is no disc at the occipitoatlantal joint, atlantoaxial joint, sacrum, or coccyx.

506.C. SIADH is a type of hyponatremia characterized by euvolemia.

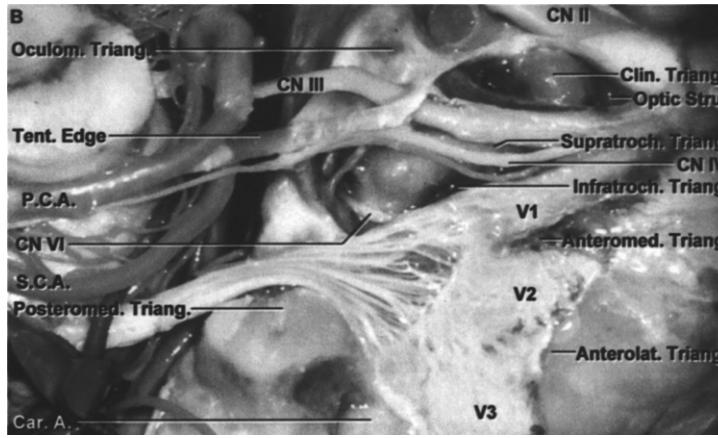
507.D. Duane's syndrome produces a characteristic pattern of eye movement with failure of abduction and retraction of the globe on adduction; the third nerve innervates the lateral rectus due to developmental failure of motoneurons in the sixth nerve nucleus.

508.C. Dilantin levels are decreased by carbamazepine.

509.A. Olivocerebellar fibers end as climbing fibers and aspartate is a common neurotransmitter in this connection. Reticulocerebellar and pontocerebellar fibers end as mossy fibers.

510.A. Tumor location is often more relevant than histology and other factors in assessing the prognosis of paraganglioma patients. For example, the metastatic rate of paraaortic paraganglioma is high (~30%), whereas that of carotid body tumors is much lower (~6%).

511.B. The anteromedial triangle can be used to expose the sphenoid sinus area.



512.B. Hyperperfusion encephalopathy is believed to result from the failure of intracranial vessels to compensate adequately for rapid increases of blood pressure. The posterior brain regions exhibit reversible edema bilaterally.

513.A.

514.C. The posterior circulation has sparse sympathetic innervation and is less well protected from hyperperfusion encephalopathies.

515.D. The central sulcus rarely joins the lateral sulcus.

516.B. Ipsilateral flushing is seen with cluster headaches. Cluster headaches also have an increased intraocular pressure, increased local skin temperature, male predominance, and are seen in older patients.

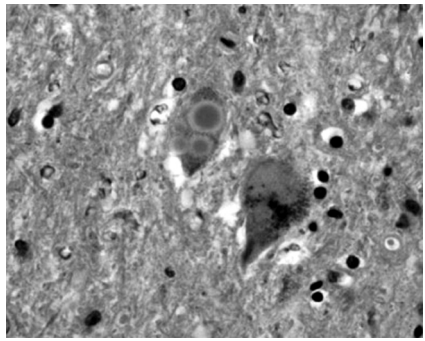
517.E. The syndrome described is Balint's syndrome. It is of interest to note that functional "streams" of visual processing have been postulated. The "where" stream is destined for further processing in the parietal lobes and subserves spatial localization and the control of eye movements. The "what" stream is destined for the temporal lobes and is concerned with the identification of objects and color vision. Evidence for this came from studying patients with Balint's syndrome.

518.D. The amygdala is not removed completely in this procedure. The most medial part abuts the basal ganglia, anterior commissure, and the tail of the caudate.

519.A.

520.D. The gluteus minimus is a medial rotator of the thigh. The others listed are all lateral rotators.

521.C. Lewy bodies are concentrically laminated, round bodies found in vacuoles in the cytoplasm. They are absent in MSA.



522.B.

523.B. Paresthesias of the fingertips or mouth indicate that the electrode is too posterior (in the region of the VC). The electrode needs to be repositioned more anteriorly. High-frequency stimulation of the VC causes contralateral paresthesias. The threshold for inducing contralateral paresthesias is higher in Vim (target) and it's usually greater than 3 V.

524.C. Deficiency of the late complement components predisposes to *Neisseria meningitidis.*

525.B. Meningiomas and choroid plexus papillomas are the most common neoplasms of the trigone of the lateral ventricle. Meningiomas originate from the arachnoid cap cells of the choroid plexus and the tela choroidea.

526.B. The status of systemic disease is the most important determinant.

527.B. Golgi tendon organs are associated with Ib (A-α) fibers. Muscle spindles are associated with Ia (A-α) fibers. Slow pain and temperature are carried by unmyelinated fibers IV (C).

528.C. *Staphylococcus aureus* causes about 60 to 90% of cases of spinal epidural abscesses. The most frequent location is the thoracic epidural space.

529.D. There is a greater risk of shunt infection with proximal revisions.

530.B. The development of sarcomas after cranial irradiation is well described. Fibrosarcomas are the most common type arising in the sella after irradiation for pituitary tumors.

531.D.

532.D. The sequence of ADH hormone release after surgery is triphasic. Initially, excessive diuresis is due to disruption of the pituitary stalk. Then, there is a release of ADH in large amounts from degeneration of distal axons. Finally, the stored ADH disappears and excessive diuresis returns.

533.E. Patients with infection commonly present with cord compression due to the predilection of echinococcus for bone, particularly vertebrae.

534.B. The mediodorsal nucleus is reciprocally connected to the prefrontal cortex.

535.C. Lymphoma metastatic to the brain tends to localize to the meninges, as opposed to the intraparenchymal (often subependymal) location of primary tumors.

536.C. The hippocampal commissure is located in the posterior component of the forniceal structure.

537.E. The centromedian nucleus is reciprocally connected to the motor cortex (area 4).

538.B. During surgery around the mastoid process, care must be taken to avoid injury to cranial nerve VII as it exits through the stylomastoid foramen, which is located medial to the insertion of the posterior belly of the digastric muscle at the digastric groove.

539.D. In addition, postoperative amnesia may result from manipulation of the fornix.

540.D. The rostral one third of the red nucleus receives dentate fibers, and the caudal two thirds receive fibers from the interposed nuclei. Stimulation of the red nucleus elicits increased tone in the contralateral flexors.

541.E.

542.E. Ketamine anesthesia increases $CMRO_2$. All other anesthetic drugs decrease $CMRO_2$.

543.D. The globus pallidus projects to three thalamic nuclei via the thalamic fasciculus is also known as Forel's field H1 (FFH1).

544.D. The major blood supply to ventricular trigone meningiomas is constant, arising from the anterior choroidal artery with only a minor component arising from the posterior choroidal artery.

545.D. Elevated markers are indicative of malignant germ cell tumors and these tumors are radiosensitive and chemosensitive, precluding surgery.

546.A.

547.C. The GCS is 9. She opens eyes to pain (2), mumbles sounds (2), and the best motor response is localizing (5). Always take the best motor response when assessing GCS.

548.B or C. Ewing's sarcoma may present with involvement of the dura and skull, and may extend to the underlying parenchyma.

549.E. This is a calvarial metastasis, an occurrence observed not uncommonly with metastatic breast carcinoma.

550.D. Sinonasal carcinoma may metastasize to multiple dural-based locations.

551.B. Recurrence after maximal radiation is an indication to operate.

552.B.

553.C. Diphtheria toxin has a predilection to sensory and motor nerves of the limbs and ciliary muscles or nerves.

554.A. Tetanus may typically present with trismus, risus sardonicus, tonic spasms, and generalized convulsions.

555.B. Symptoms appear 12 to 48 hours after ingestion and may be preceded by nausea, vomiting, and diarrhea. The convergence difficulty is usually followed by ptosis and extraocular muscles paralysis.

556.D. This is a typical feature of Reye's syndrome.

557.C. Patients with spinal multiple myeloma typically present with hypercalcemia, bone pain characteristically absent at rest, and spinal canal invasion in ~10% of cases.

558.B. Myeloma cells in two or more peripheral blood smears are required.

559.C. It represents spread via spinal epidural veins.

560.C. Facioscapulohumeral dystrophy, or Landouzy-Dejerine's syndrome, is associated with a defect on chromosome 4.
561.A. Werdnig-Hoffman's disease has autosomal-recessive inheritance on chromosome 5q.
562.E. Myotonic muscular dystrophy has autosomal-dominant inheritance on chromosome 19.
563.B. Cri-du-chat is due to a 5p deletion and results in microcephaly, hypertelorism, and congenital heart disease.
564.D. Friedreich's ataxia has autosomal-recessive inheritance on chromosome 9.

565.B. Diltiazem is the preferred agent for patients with systolic heart failure as it produces less myocardial depression than verapamil.
566.A. Verapamil's side effects include hypotension and worsening of systolic heart failure due to negative inotropic effect.
567.C. Digoxin is indicated for chronic rate control of atrial fibrillation. Because of its delayed action, however, it is not indicated in acute atrial fibrillation.
568.D. Procainamide is contraindicated in patients with prolonged Q-T interval as it prolongs Q-T interval and may be proarrhythmic. Its use is to convert atrial fibrillation to normal sinus rhythm.
569.E. Beta-blockers are indicated for rate control of atrial fibrillation in the setting of a hyperadrenergic state, such as acute myocardial infarction after bypass surgery.

570.B. Gliosarcoma has the same histologic features as glioblastoma multiforme. In addition, it does stain for reticulin (sarcomatous part of the tumor).

571.D. Blunt trauma injuries to the cervical vertebral artery are more often managed by ligation than repair. Ligation may be risky because ~20% of the general population has a complete collateral circulation. Proximal occlusion may be accomplished by an anterior approach with mobilization of the sternocleidomastoid. Endovascular treatment with detachable balloons is a valid option for management.

572.C. Arsenic causes peripheral neuropathy, nausea, and vomiting.
573.E. Lead causes encephalitis in children, also pica, irritability, seizures, abdominal cramping, ataxia, coma, and high intracranial pressure.
574.B. Manganese causes a Parkinson-like syndrome.
575.E.
576.A. Mercury causes peripheral neuropathy, cerebellar signs, psychologic dysfunctions, tremor, movement disorders, and renal tubular necrosis.
577.D. Aluminum may present with a picture of Alzheimer's disease.

578.A. Left atrium accounts for 65 to 75% of embolisms, mainly the left appendage. The left ventricle and ventricular aneurysms account for 5% each.

579.E. Uremia is most likely to cause potassium depletion.

580.B. Tetany is the first sign of magnesium depletion. Delirium occurs usually before convulsions. Increase in deep tendon reflexes is observed usually.

581.D. Ca^{2+} concentration is 3 mEq/L.

582.B. The MRI scan demonstrates an intramedullary astrocytoma, which occurs most commonly in the cervical spine. Lower motor signs may be at the level of the lesion and may aid in localization. These types of tumors are the most common intramedullary tumors in children and are usually of fibrillary type.

583.C.
584.A.
585.D.

586.C. Rickets presents with increased alkaline phosphatase, decreased serum calcium and phosphate levels.
587.D. Paget's presents usually with increased alkaline phosphatase, normal serum calcium and phosphate levels; serum calcium levels may be increased depending on the stage of the disease.
588.A. Hyperparathyroidism presents usually with increased alkaline phosphatase increased serum calcium and decreased or normal phosphate levels.
589.D. Primary osteoporosis presents usually with increased alkaline phosphatase normal serum calcium and phosphate levels.
590.B. Hypoparathyroidism presents usually with normal alkaline phosphatase decreased serum calcium and increased phosphate levels.

591.E.
592.B.
593.C.
594.A.
595.D.

596.C. Scan 1 shows a wedge infarct and scan 2 shows a typical watershed infarct
597.B. that can also be due to small embolic infarcts. Both endocarditis and occlu-
598.A. sive disease of a single artery may result in scan 1. Watershed infarcts may typically present with "man-in-a-barrel syndrome."

599.B.

600.C. All the other choices result in an efferent defect.

601.D. Metabolic neuropathy is typically symmetric and bilateral and will rarely present with an afferent pupillary defect clinically.

602.C. An improvement in mixed venous oxygen content will often improve the hypoxemia in the setting of a shunt.

603.B. The half-life is 72 hours.

604.A. Conversion of prothrombin to thrombin is the most time consuming and is usually measured as the prothrombin time (PT); it is in the range of 11 to 13 seconds.

605.B. Image 2 shows a venous angioma, which can be caused be arrested development.

606.D. Dural arteriovenous malformation are usually acquired after dural thrombosis. Neither cavernous malformation (Image 1) nor venous angioma (Image 2) is an acquired lesion.

607.B. Blue rubber nevus syndrome is associated with venous angiomas.

608.D.
609.C.
610.E.
611.B.
612.A.

613.B. The glomerulus is formed by the Golgi cell, the granule cell, and the mossy fiber.

614.A. The granule cell is the only excitatory cell within the cerebellum.

615.D. Basket cells end in a rete of terminals around the Purkinje cell.

616.C. Purkinje cells synapse with the deep cerebellar nuclei.

617.D. Early signs of cyanide poisoning include general weakness, malaise, early giddiness, inebriation, confusion, headache, vertigo, dizziness, confusion, and hallucinations. Tachypnea and hyperpnea generally precede apnea.

618.E. All are important in wound healing.

619.D. Aminoglycosides act by inhibiting protein synthesis through irreversible ribosomal attachment.

620.D. Polymyxin does not cause neuromuscular blockade.

621.B. The image represents a vertebral artery aneurysm. The preferred treatment is direct clipping of this aneurysm. The Allcock test assesses the patency of the circle of Willis via carotid occlusion. Vasospasm in this area can cause midbrain and medullary syndrome including respiratory arrest and neurogenic pulmonary edema. A lumbar arachnoid catheter is advised to allow CSF drainage.

622.B. When removing an intramedullary spinal cord tumor, one is more likely to encounter dilated veins at the caudal end of the mass. The other points are general principles of spinal cord tumor resection. Note that it is useful to seek out the blood supply of the tumor before debulking to keep the field relatively free of blood.

623.A. Galactocerebroside accumulates in Krabbe's disease. Ganglioside accumulates in Tay-Sachs and Sandhoff's diseases. Long chain fatty acids accumulate in adrenoleukodystrophy.

624.C. The T-reflex represents the monosynaptic stretch reflex elicited by tapping a tendon.

625.C. The trochlear nerve arises at the level of the lower midbrain (inferior colliculus level).

626.D. The patient likely has Eaton-Lambert syndrome with oat cell carcinoma.

627.B. Total body potassium excess of 100 to 200 mEq is required to produce a rise of 1 mEq/L in serum potassium.

628.B. The ulnar nerve has no supply from the C6 root.

629.B. Cervical roots C2 and C3 innervate this muscle.
630.D. Involved in the phrenic nerve and the brachial plexus.
631.C.
632.D. Innervated by C3, C4 and C5 (dorsal scapular nerve).
633.E. Innervated by the pudendal nerve (S2–4).
634.B. Innervated by the accessory nerve and C2 roots.

635.A. Hypnagogic hallucinations are seen with narcolepsy. Hypnagogic or hypnopompic hallucinations are visual, tactile, auditory, or other sensory events, usually brief but occasionally prolonged, that occur at the transition from wakefulness to sleep (hypnagogic) or from sleep to wakefulness (hypnopompic).

636.E. Vitamin A intoxication is associated with pseudotumor cerebri.
637.A. Beriberi is associated with thiamine deficiency.
638.C. Increased serum homocysteine and methylmalonic acid is associated with vitamin B_{12} deficiency.
639.B. Pyridoxine deficiency is associated with lower extremity paresthesias.

640.A. Barbiturates are used as antiepileptics and in the treatment of intractable increased intracranial pressure.
641.C. Both picrotoxin and bicuculine are GABA receptor blockers.
642.B. Baclofen in used as a centrally acting muscle relaxant.
643.C. Bicuculline is a selective GABA antagonist directly at the site where GABA binds.

644.E. The two aneurysms are a calcified thrombotic basilar artery aneurysm and a posterior communicating artery aneurysm.

645.D. The lesion presented is a colloid cyst of the third ventricle. A lumbar puncture is contraindicated prior to the placement of a shunt or a ventricular catheter due to the risk of herniation.

646.D. Torsades de pointes presents with prolonged QT intervals.

647.C. In early ARDS, the chest x-ray may be unrevealing while the patient may present with a hypoxemia refractory to supplemental oxygen.

648.B. Bicarbonate therapy does not improve outcome in diabetic ketoacidosis, regardless of the severity of the acidosis.

649.B. The MRI shows an enhancing mural nodule with an associated cyst. Pathology shows highly vascular tissue and stromal cells characteristic of hemangioblastoma.

650.D. The following T2-weighted MRI shows enhancement of the medial temporal lobe, a finding representative of herpes encephalitis.

651.B. The superficial peroneal nerve innervates the peroneus longus and brevis, which evert the foot. A lesion of the deep peroneal nerve affects ankle dorsiflexion. A lesion of the common peroneal or sciatic nerve affects both ankle dorsiflexion and foot eversion. Sciatic nerve lesion also affects foot flexion and inversion.

652.C. The order of the brachial plexus structures is root, trunk, division, cord, branch.

653.C. Fissure splitting, temporary clipping, dissection of M2 branch from dome, and definitive clipping is the proper order of steps for clipping this difficult aneurysm.

654.D. Aberrations of genes coding for cell cycle regulatory proteins involved in the control of G_1/S phase transition have been found in gliomas and include mutation or deletion of genes like *p53*, retinoblastoma, cyclic AMP-dependent kinase number 2 (*CDKN2*) A/B, and amplification or overexpression of *CDK4* and *CDK6*.

655.B. Oligodendrogliomas may exhibit loss of chromosomal regions on 1p and 19q13. Other chromosomal regions that may be lost from oligodendrogliomas are 1p36, 9p, and 22. There may be evidence of increased numbers of chromosome 7.

656.D. The superior hypogastric plexus lies in front of the promontory of the sacrum between the two common iliac arteries and is sometimes called the presacral nerve. It then divides into the right and left inferior hypogastric plexuses.

657.C. The Papez circuit includes the cingulate gyrus, hippocampus, mammillary
658.C. bodies, and anterior nucleus of the thalamus. The lateral parabrachial
659.B. nucleus of the amygdala receives inputs from the lateral olfactory tract, pyriform cortex, hypothalamus, paraventricular thalamus, and the solitary tract nucleus. The medial septal nucleus projects from the fimbria of the hippocampus.

660.D. AIDS is frequently associated with platelets disorders in the ICU.

661.D. This MRI shows a vein of Galen malformation, which is usually associated with macrocephaly and hydrocephalus.

662.A. This MRI demonstrates an epidural abscess, which more frequently occurs in the thoracolumbar region.

663.B. Urinary magnesium loss is most prominent with loop diuretics.

664.C. The superior salivatory nucleus sends axons via the nervus intermedius (VII) to the greater superficial petrosal nerve and then to the pterygopalatine ganglion.

665.D. The occulomotor nerve (III) carries parasympathetics from Edinger-Westphal's nucleus to the ciliary ganglion.

666.A. Arnold's nerve is a branch of the vagus nerve (X) supplying sensation to the dura of the posterior fossa.

667.E. The deep petrosal nerve carries sympathetic fibers from the internal carotid artery from the superior cervical ganglion.

668.A. Both nerves contain sensory inputs from the outer ear. The glossopharyngeal nerve controls elevation of the pharynx, whereas the facial nerve has no actions on pharyngeal muscles.

669.B. Dobutamine is an adrenergic agent that does not cause peripheral vasoconstriction.

670.B. Thiocyanate is cleared by the kidneys and its accumulation with the use of nitroprusside may cause a toxic syndrome.

671.B. Single punched out lesion without sclerotic edges is typical.

672.B. Eosinophilic granuloma may be a monostotic form of Langerhans cell histiocytosis.

673.C. In Paget's disease, one may observe body destruction (early) and sclerosis (late).

674.A. Albright's syndrome is characterized by unilateral fibrous dysplasia, pigmented skin lesions, and precocious puberty.

675.D. Epidermoid has characteristic scalloped edges.

676.A. *Pneumocystis carinii* pneumonia is the most common cause of ICU admission in HIV-positive patients. It is usually treated with trimethoprim-sulfamethoxazole. Toxoplasma is the most common intracranial infection in HIV-positive patients.

677.C. There are nine cases of transmission for every 10,000 exposures.

678.C. The lesion most likely represents a lobulated arachnoid cyst.

679.D.

680.A. The Golgi has a function in possessing enzymes that are extremely important in sugar and lipid chemistry of the eukaryotic cell.

681.B. The endoplasmic reticulum is important in drug detoxification; for example, adding hydroxyl groups to a lipid soluble type compound makes it more water soluble and thus easier to remove from the body.

682.B. Glycogen formation and breakdown occurs in the endoplasmic reticulum; this is particularly important in the liver. Glycogen, a polymer of glucose-1-phosphate, represents a quick source for energy.

683.C. Both the Golgi membranes closest to the nucleus (forming face) and the endoplasmic reticulum have a lamellar or tube-like membranous system. The Golgi membranes away from the nucleus (maturing face) are much more like plasma or organelle membranes.

684.C. True melanin is made by tyrosinase.

685.A. The amygdala sends efferents to the nucleus accumbens via the amygdalostriate fibers. All others are afferent sources to the amygdala.

686.D. Total parenteral nutrition has been known to cause hypercapnia due to excessive carbohydrates promoting carbon dioxide retention, impaired oxygenation due to fatty acid damage to pulmonary capillaries, and acalculous cholecystitis due to bile stasis secondary to absence of lipids in the proximal small bowel.

687.A. This scan shows a teratoma that is associated with elevation of CEA levels.

688.B. Paraneoplastic sensory neuropathy with Anti-Hu antibodies is associated with limbic encephalitis (as seen on this MRI), seizures, epilepsia partialis continua, cerebellar ataxia, autonomic instability, myelitis with patchy weakness, and brainstem encephalitis.

689.A. Tabes dorsalis presents 15 to 20 years after initial syphilitic infection and is characterized by dorsal root and posterior column involvement as seen on this myelin-stained cord section.

690.C. Massive pulmonary embolism can result in significant increased dead space
691.C. and respiratory acidosis; on the other hand, smaller pulmonary embolisms can present with hyperventilation and hence respiratory alkalosis. Liver cirrhosis may also cause hyperventilation. Aminoglycosides can cause respiratory acidosis.

692.B.

693.A.

694.B. Tractography is a procedure to demonstrate the neural tracts. It utilizes special techniques of magnetic resonance imaging (MRI) and computer postprocessing. Information about direction of flow is provided by tractography but not about connections between different structures in the brain.

695.A. The scan shows an atypical dermoid cyst. Dermoid cysts can contain fat, which gives them a high signal intensity on T1-weighted sequences. A congenital dermal sinus tract can be associated with a dermoid cyst. Choice B is associated with paraganglioma. Choice C is representative of Antoni A pattern in acoustic neuromas.

696.C. The MRI scan shows bilateral acoustic neuromas, pathognomonic of neurofibromatosis type 2. Intertriginous freckling is a feature of neurofibromatosis type 1.

697.D. Carbonic anhydrase inhibitors (i.e., acetazolamide) can cause proximal renal tubular acidosis.

698.C. Methylprednisolone is not recommended in the treatment of emergent Addisonian crisis.

699.D. All three medications have been shown to help in the treatment of SIADH, with variable side-effect patterns.

700.A. Plasma types B and O can be safely transfused in a patient with blood type B as both these plasma types do not contain antibodies against B type blood.

701.E. Neurogenic shock is characterized by dilatation of arterioles and venules and decreased peripheral vascular resistance. It also presents with warm, dry skin, bradycardia, and hypotension.

702.A. The urinary system is most commonly involved in patients with gram-negative septicemia, followed by the respiratory system.

703.C. Stool culture has a sensitivity of greater than 90% in diagnosing *C. difficile* enterocolitis. Both latex agglutination and tissue culture assay for cytotoxin have a sensitivity of around 70%. Stool microscopy is not used to diagnose this condition.

704.D. Halothane increases cerebral blood flow the most; it is followed by enflurane and isoflurane.

705.C. Thiopental decreases intracranial pressure; the other listed agents increase intracranial pressure.

706.A. Isoflurane has been shown to cause tachycardia transiently in children.

707.B. Enflurane increases systemic vascular resistance. Isoflurane decreases it.

708.C. Both NF1 and NF2 have autosomal-dominant patterns of inheritance.

709.D. Retinal hemangiomas are associated with von Hippel–Lindau syndrome.

710.A. Iris hamartoma or Lisch nodule is seen in NF1.

711.D. Neurofibromatosis type 5 is the segmental type.

712.E. The anterior clinoid process is most likely going to have to be drilled to gain access to the neck of this aneurysm.

713.C. The superior cerebellar artery is seen in neurovascular conflict with the trigeminal nerve. More proximally, though, the artery is seen near the tentorium, which is in very close relation to the trochlear nerve.

714.A. The posterior approach is unfavorable in this case because the angle of the tentorium is very steep and would necessitate severe retraction on the cerebellum. In addition, the posterior approach presents a very narrow corridor limited by the internal cerebral veins.

715.D. Papaverine inhibits antiparkinsonian effect of levodopa. Fluconazole
716.C. increases serum phenytoin and decreases warfarin metabolism. Thyroid
717.B. hormones enhance clotting factor catabolism. Meperidine may cause hyper-
718.C. tension, rigidity, and excitation when used with monoamine oxidase
719.A. inhibitors.

720.D. The other medications tend to further exacerbate the symptoms of malignant hyperthermia.

721.C. Colon carcinoma has a predilection to metastasize to the liver and other visceral organs.

722.B. The lateral, medial, and posterior cords carry their names in relation to the second and third segments of the axillary artery.

723.C. This type of spondylolisthesis is caused by a defect in the pars interarticularis, occurs in 90% of cases at L5-S1, is usually bilateral, and is more common in males.

724.D. The superior outer quadrantanopia is due to involvement of von Willebrand's knee.

725.A.

726.A.

727.C.

728.B. Meyer's loops are interrupted causing a homonymous superior quadrantanopia.

729.E.

730.B. Ulnar nerve entrapment can occur at the arcade of Struthers.

731.C. Extensor carpi ulnaris palsy may be due to a constriction at the arcade of Frohse.

732.A. The brachial artery, along with the median nerve, passes under Struthers' ligament.

733.A. Reservoir sign, or intermittent large-volume CSF rhinorrhea, is a relatively uncommon occurrence in patients with sphenoid sinus encephaloceles. The leak of fluid is usually insidious.

734.B. Scoliosis occurs in 66%, whereas radicular pain occurs in 50% of patients.

735.C. Weakness occurs in 51%, whereas radicular pain occurs in 44% and scoliosis in 36% of patients.

736.D. All are valid mechanisms.

737.D. De Quervain's syndrome is characterized by tenosynovitis of the abductor pollicis longus and extensor pollicis brevis muscles. The nerve conduction velocities are typically normal.

738.A. The roof of the fourth ventricle contains both the superior and inferior
739.B. medullary veli. The floor of the fourth ventricle is formed by the rhomboid
740.B. fossa, which contains the facial colliculus and hypoglossal trigone.
741.B.

742.C. The scan shows a cephalohematoma, which is treated with head wrapping and possibly needle aspiration.

743.B. The notochord induces the formation of the neural plate and neural tube. The neural tube regions give rise to the alar and the basal plates. The alar plate contains sensory/integrative nerve cell bodies of brain and spinal cord and gives rise to the dorsal horn. The basal plate contains motor neurons of brain and spinal cord and gives rise to the ventral horn.

744.C. Cheyne-Stokes respiration occur with diencephalon lesions. Central neuro-
745.D. genic hyperventilation occurs with midbrain lesions. Apneustic respiration
746.B. occurs with pontine lesions. Ataxic respiration occurs with medulla lesions.
747.A.

748.B.
749.A. The middle cerebellar peduncle contains only afferent fibers.

750.B. The angiogram demonstrates a primitive trigeminal artery. The persistent acoustic artery passes through the internal auditory meatus.

751.E. The overall rate of HIV transmission from a single percutaneous exposure to HIV-infected blood is of the order of 0.3%. Postexposure prophylaxis (PEP) has been shown in one study to reduce this rate by 80%.
752.D. Epidemiologic studies of health care workers exposed to hepatitis C virus (HCV) through a needlestick or other percutaneous injury have found that the incidence of infection averages 1.8% per injury.
753.D. The risk of acquiring hepatitis B from a needlestick when the source was hepatitis B antigen-positive ranges from approximately 2 to 40%, depending on the source's level of viremia.

754.D. The scan shows straight sinus thrombosis.

755.A. Malignant hyperthermia has an autosomal-dominant inheritance pattern. It may be caused by halothane or succinylcholine. Body temperature increase is about 1℃ every 5 minutes. It is treated with dantrolene and discontinuation of the anesthetic.

756.D. The scan shows a cavernous angioma occurring at the thalamocaudate recess. These lesions may be associated with venous angiomas.

757.A. Type 1 modic changes show decreased intensity on T1-weighted images and increased intensity on T2-weighted images. Type 2 modic changes show increased intensity on T1-weighted images and isointense signal intensity on T2-weighted images. Histopathology on type 1 change demonstrates disruption and fissuring of the end plates and vascularized fibrous tissue. On type 2 changes, yellow marrow replacement is seen. Type 1 changes may convert to type 2 after a few years. There appears to be a spectrum of vertebral body marrow changes associated with degenerative disk disease.

758.D. The lesion represents a syrinx at the level of the inferior cerebellar peduncle. The abducens nerve arises at a higher level and is less likely to be affected. The anterolateral system courses ventral to the lesion and may be affected. The vestibulocochlear nucleus is also located at this level.

759.A. Ketamine raises systemic arterial blood pressure but not necessarily the perfusion in hypovolemic states. In hypotensive states of short duration from endotoxin treatment, it improved the hemodynamics by augmenting the perfusion and the systemic pressure.

760.C. The scans show a typical intramedullary ependymoma with blockage of CSF flow, which is associated with Froin syndrome (clotting and xanthochromia in the CSF) and Queckenstedt's sign, which is failure of jugular vein compression to increase CSF. The cervical type of intramedullary ependymoma is usually of cellular type, more frequent in women in their mid-40s.

761.B. The MRI set demonstrates basilar meningitis with a trapped fourth ventricle and foramina of Luschka, which occurs in sarcoidosis. Elevated angiotensin-converting enzyme levels are also a feature of this disease.

762.B. The proximal tubule plays a role in secreting organic acids and reabsorbing
763.A. Na^+, water, glucose, bicarbonate, amino acids, and phosphate. The distal
764.B. tubule's role involves secretion of H^+ and K^+ and reabsorption of Na^+ and Cl.
765.C. The glomerular filtration rate is at its peak in young adulthood, at about 120 mL/min.

766.A. The images show craniopharyngioma. The most significant factor associated with recurrence is extent of resection. Histology type is not correlated with frequency of recurrence. Monoclonal antibody labeling index (MIB-1 LI) >7% is associated with higher likelihood of recurrence. Malignant transformation to carcinoma exceptionally occurs.

767.A. Central neurocytoma looks like oligodendroglioma histologically but is positive for synaptophysin on immunohistochemistry.

768.A. The parietal operculum is caudal to the inferior frontal gyrus. Directly inferior to the inferior frontal gyrus is the sylvian fissure.

769.C. Nitric oxide promotes the formation of cyclic guanosine monophosphate (cGMP).

770.D. Symptomatic 70 to 90% stenosis of the carotid on the angiogram carries a risk
771.B. of stroke of 26% over 2 years, or 13% per year. Asymptomatic 70 to 90%
772.C. stenosis of the carotid on the angiogram carries a risk of stroke of 11% over 5 years, or 2% per year. Post–carotid endarterectomy in preoperative symptomatic 70 to 90% stenosis of the carotid on the angiogram carries a risk of stroke of 9% over 2 years, or 4.5% per year.

773.A. All the other medications cause hyperkalemia.

774.C. Intracellular methemoglobin appears as hyperintense on T1 and hypointense on T2, and is usually present from 3 days to 2 weeks after a hemorrhage. Extracellular methemoglobin, which appears after 2 weeks, is hyperintense on T1 and T2. The images show hyperintensity on T1 and iso- to hypointensity on T2, consistent with intracellular methemoglobin toward the end of 2 weeks following the hemorrhage.

775.C. Ethanol has a molecular weight of 46 and is lethal at levels greater than 350
776.D. mg/dL (least lethal). Methanol has the lowest molecular weight (32) and is the least lethal out of the three remaining substances (need 80 mg/dL for lethality). Ethylene glycol has the highest molecular weight (61) and is the most lethal (only need 21 mg/dL to cause death).

777.E. Cryoprecipitate is used to treat acute blood loss in von Willebrand's disease.

778.D. The scan shows a foramen magnum tumor. All the stated clinical findings are associated with this tumor location; however, neurogenic bladder tends to occur very late.

779.D. Autonomic symptoms occur early.

780.A. There is no sensory dissociation.

	Conus Medullaris Syndrome	Cauda Equina Syndrome
Presentation	Sudden and bilateral	Gradual and unilateral
Reflexes	Knee jerks preserved but ankle jerks affected	Both ankle and knee jerks affected
Radicular pain	Less severe	More severe
Low back pain	More	Less
Sensory symptoms and signs	Numbness tends to be more localized to perianal area; symmetrical and bilateral; sensory dissociation occurs	Numbness tends to be more localized to saddle area; asymmetrical, may be unilateral; no sensory dissociation; loss of sensation in specific dermatomes in lower extremities with numbness and paresthesia; possible numbness in pubic area, including glans penis or clitoris
Motor strength	Typically symmetric, hyperreflexic distal paresis of lower limbs that is less marked; fasciculations may be present	Asymmetric areflexic paraplegia that is more marked; fasciculations rare; atrophy more common
Impotence	Frequent	Less frequent; erectile dysfunction that includes inability to have erection, inability to maintain erection, lack of sensation in pubic area (including glans penis or clitoris), and inability to ejaculate
Sphincter dysfunction	Urinary retention and atonic anal sphincter cause overflow urinary incontinence and fecal incontinence; tend to present early in course of disease	Urinary retention; tends to present late in course of disease

781.E. The aorta gives off, from proximal to distal, the brachiocephalic trunk, left common carotid and left subclavian arteries.

782.B. With bilateral internuclear ophthalmoplegia, there is an adduction deficit in both eyes. This is observed in bilateral lesions on the medial longitudinal fasciculus.

783.A. Preganglionic sympathetic fibers secrete acetylcholine.

784.B. The locus ceruleus contains noradrenaline.

785.B. The periaqueductal gray contains the locus ceruleus. It also contains the dorsal raphe nucleus and enkephalin releasing neurons.

786.C. Both Wernicke's and global aphasias display repetition and comprehension deficits.

787.C. Watershed infarcts occur in areas between the major vascular territories and are due to a global decrease in cerebral perfusion.

788.D. McConnell's capsular arteries arise directly from the intracavernous carotid artery.

789.D. Radionuclide scans have a relatively high sensitivity in detecting discitis.

790.A. NAA, found in neurons and axons, is used as a neuronal marker. A reduction in the NAA signal reflects neuronal loss or injury, as seen in many brain

pathologies including neurodegenerative diseases. NAA peaks typically represent neuronal density. Moderately increased choline peaks and reduced NAA signal intensities indicate low-grade gliomas; high-grade tumors are characterized by distinctly higher choline peaks and even lower NAA signals. The presence of lipid signals indicates tissue necrosis.

791.B. Aspergillosis has a predilection for the basal ganglia in some cases. It tends
792.D. to invade blood vessels, cause hemorrhagic infarcts, and may cause formation of paranasal sinus mycetoma. Coccidioidomycosis can cause meningitis and caseating granulomas. The diagnosis of early cerebral infarction in a patient considered at risk for invasive aspergillosis even without overt pulmonary disease is an indication to institute aggressive antifungal therapy.

793.C. The MRI scan demonstrates leptomeningeal gliomatosis associated with a high-grade glioma in the left occipital area. The best therapeutic option, given the diffuse nature of the disease is, initially, chemotherapy and radiation.

794.C. The glossopharyngeal nerve innervates the stylopharyngeus.

795.D. Functional residual capacity (D) does not change during exercise, and is usu-
796.D. ally 2.4 L; it is the sum or residual volume (C) and expiratory reserve volume
797.B. (ERV), or the difference between vital capacity (B) and ERV. VC is usually
798.C. around 4.4 to 5 L and is measured by having the patient inhale profoundly and exhale fully into a spirometer. Residual volume cannot be measured directly and needs to be calculated as a percentage of exhaled versus inhaled 10% helium containing solution.

799.C.
800.B. Point 3 on the MR spectroscopy represents an area of tumor (glioma), which shows an elevated Chol/Cr ratio and a decreased NAA peak.

801.B. The formula represents oxygen uptake.

802.D. $(Cc\,O_2 - Ca\,O_2)/(Cc\,O_2 - Cv\,O_2) = Qs/Qt =$ shunt fraction.

803.A. $Q = P\pi r^4/8\,VL$.

804.C. If the pencil is pulled from his eye, there should be adequate measures to stop bleeding and irrigate the wound. This can only be done properly in the operating room. This patient should be managed with antiepileptic medication, broad-spectrum antibiotics, CT scan, immediate open surgical debridement, and follow-up MRI in a week.

805.D. The patient has ossification of posterior longitudinal ligament (OPLL), which is best managed with cervical corpectomy and fusion.